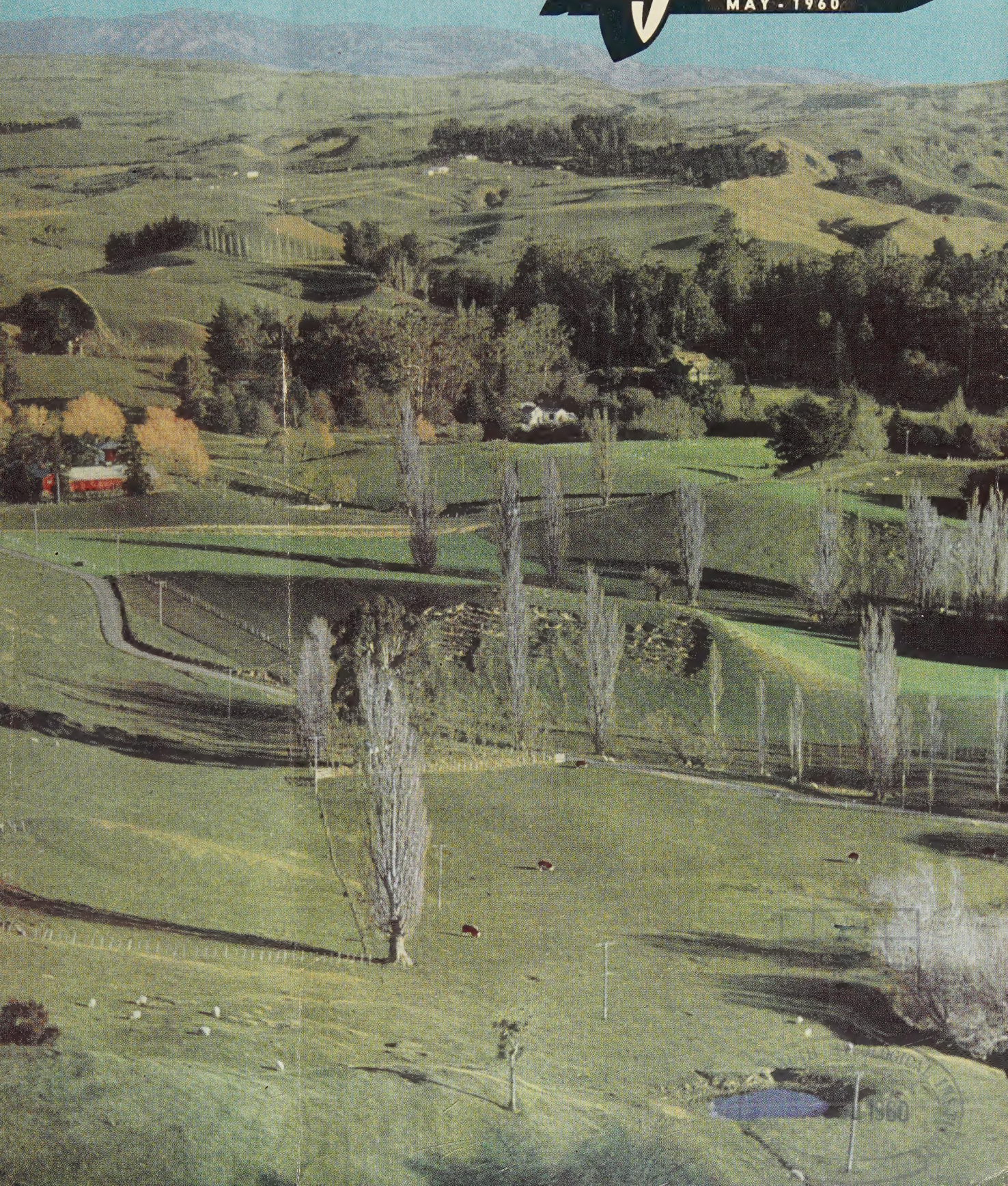


NEW ZEALAND
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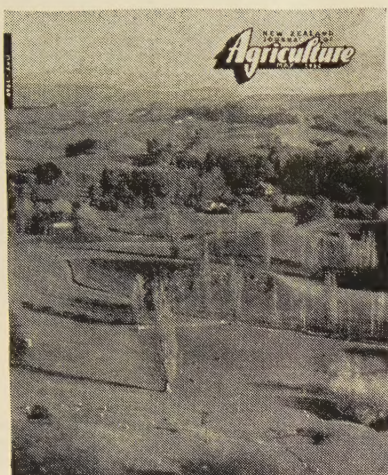
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Minister of Agriculture

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N.Z. Forest Service photo by J. H. Johns

Rolling pasture land between Matapouri and Crownthorpe, Hawke's Bay, is shown on our cover this month. This extensive view emphasises most strikingly how grasslands dominate the New Zealand landscape. The tree-studded paddocks in the foreground and buildings ringed by plantations further back are on Tunanui Station, the property of Sir Andrew Russell, who commanded the New Zealand Division in the First World War.

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FAO's Director-General Studies New Zealand Farming Methods





OPPOSITE PAGE: Upper—On an area at Ruakura Animal Research Station where meat production under different systems of stocking is being studied. From left: Dr C. P. McMeekan, Superintendent of Ruakura, Mr Sen, Dr D. Rogers, Mayor of Hamilton, and Mr P. W. Smallfield, Director-General, Department of Agriculture. Lower—Dr P. D. Sears, Director, Grasslands Division, Department of Scientific and Industrial Research, discussing trials. On Mr Sen's right are Mr Smallfield and Dr P. C. Barclay, who will be one of the New Zealand delegates to the 8th International Grassland Congress at Reading in July. Dr Sears leads the New Zealand delegation.

[Lower photograph by D.S.I.R.]

D. S. M. Phillips, Senior Principal Scientific Officer, Ruakura, explains how the milking behaviour of cows is studied with recording equipment (right) specially designed by officers at Ruakura.

METHODS by which New Zealand has developed a high output of farm produce per acre and per unit of labour were demonstrated to the Director-General of FAO*, Mr B. R. Sen, during his recent visit to New Zealand. He was also shown how research is opening up prospects for per acre production considerably higher than targets set in comparatively recent times and since achieved. Mr Sen, who is visiting as many member countries of FAO as possible to stimulate interest in the organisation's work, is the first Director-General of FAO to visit New Zealand. In company with the Director-General of Agriculture, Mr P. W. Smallfield, he inspected research stations, Massey and Lincoln Agricultural Colleges, several typical dairy and sheep farms, and land development work.

MR SEN was obviously impressed by research activities in New Zealand and keenly interested in the extent to which improved practices have been adopted by farmers. Persuading food producers to accept the better techniques demonstrated by research was, he indicated, a main problem in many parts of the world.

Freedom from Hunger

How to improve food supplies in a world in which about a third of all the people are underfed is one of FAO's most important missions. To focus world attention on this continuing problem and to mobilise national and international effort toward its solution Mr Sen proposed at the twenty-sixth session of the Economic and Social Council of United Nations in 1958 a

"Freedom from Hunger Campaign" and it has been unanimously supported by the members of FAO. The overall objectives are:

- To achieve better understanding of the problem of providing adequate food for the present and future world population in the light of its rapid increase and of methods by which the gap between available and optimum food supplies can be met.
- To stimulate countries to take action aimed at bridging the gap.

New Zealand is supporting this campaign, which is essentially an intensification of activities for which FAO is principally responsible. The basic aim in overcoming hunger is to build up agricultural production in the less developed countries. New Zealand is already helping in this way both by provision of direct technical assistance in Colombo Plan countries and in training of students from those countries in various branches of agriculture.

* The Food and Agriculture Organization of United Nations.

World Seed Campaign

Extensive use of high-quality seed of improved varieties is recognised as one of the most generally and economically applicable measures for increasing productivity and quality of agricultural, horticultural, and forest products. Recognition of this has led FAO to launch an international seed campaign for 1961.

New Zealand has had a highly developed programme of seed improvement for about 30 years and to that extent the FAO seed campaign aims have been anticipated here. Nevertheless, New Zealand is cooperating in the campaign through its existing Small Seeds Advisory Committee. This committee comprises representatives of farmers, seed

merchants, and the Department of Agriculture. Mr Sen saw at the Department of Agriculture's Seed-testing Station at Palmerston North how New Zealand had developed a system for ensuring that farmers could be supplied with high-quality seeds.

New Zealand has advised FAO of its willingness to provide training assistance in seed certification and improvement under existing technical assistance schemes. Actually this would be only a continuation or extension of assistance already being given, as for some years Colombo Plan students have received such instruction as part of agricultural courses at Massey and Lincoln Colleges.

The general technical training in agriculture which visiting students

receive is regarded by New Zealand authorities as fundamental to progress in the use of improved seeds, because this must be directed by efficient general farm advisory and technical officers. New Zealand has, therefore, already provided many students from under-developed countries with a background that fits them to assist with the national seed campaigns which FAO is fostering.

Extent of Technical Assistance

New Zealand has supplied considerable technical assistance in agriculture to under-developed countries, both by sending experts to those countries and in training students in New Zealand.

Up to 1 March 1960, 14 agricultural experts in various fields had assisted a total of six countries, three officers going to Pakistan, three to India, three to Ceylon, two to Indonesia, two to Burma, and one to Nepal. Training in

FAO and Its Director-General

FAO arose from the Hot Springs (Virginia) Conference called by President Roosevelt in 1943 to consider ways for the fulfilment of his "Third Freedom"—freedom from want. The organisation was the first of the United Nations agencies to be constituted—at Quebec on 16 October 1945—and Mr E. J. Fawcett, Director-General of Agriculture from 1943 to 1957, was elected to the first Executive Committee of FAO.

FAO deals essentially with long-term food and agriculture policy, its chief functions being to investigate and advise. As New Zealand has reached a relatively high standard in agricultural development and a high average standard of living, its role within FAO has been in offering aid rather than receiving it.

Nevertheless FAO has for us a special significance because it deals with international problems in the distribution of food. It therefore provides a very important forum in which New Zealand can draw attention to policies which react unfavourably on countries which have developed highly efficient production of important foods and whose economic welfare depends largely on their sale on the world's markets.

New Zealand has always been vitally interested in the work of FAO's Committee on Commodity Problems (CCP), of which she has been a member since 1955. To find ways of reconciling the interests of needy states and of exporting countries likely to be affected by indiscriminate disposal of surpluses the CCP set up a special sub-committee, known as the Consultative Sub-Committee on Surplus Disposals (CSD), in Washington.

A most helpful function has been the setting out by the CSD (and adoption by 40 nations) of principles to be adopted by countries to ensure that surpluses are disposed of without harmful interference with normal production and trade patterns. Countries have not always observed the principles to the letter, but their mere existence and the fact that they can be invoked have been of considerable value to New Zealand.

FAO discussions enable countries such as New Zealand to question the validity of some of the so-called food surpluses. For instance "surplus" butter which in 1958 provided disastrous competition for the New Zealand product was offered for sale largely because of price-support policies (including maintenance of artificially high local retail prices) within some of the exporting countries. In such circumstances the true relationship between available world supplies and needs tends to be obscured and the interests of efficient producers suffer.

Agricultural Support Measures

In April 1959 FAO set up a special panel of experts to study agricultural support measures and its report (to be published soon) will be discussed at the next meeting of the Committee on Commodity Problems in June. The CCP hopes to have a list of guiding principles on agricultural support measures to place before the 1961 FAO Conference. The aim will be to minimise the adverse effects on international trade of policies of agricultural protectionism.

FAO's concern with the roots of problems in the production and disposal of food and other essential

agricultural commodities makes its work of immense value to New Zealand. Great significance attached therefore to the visit of the Director-General of FAO to New Zealand.

The Director-General

Mr B. R. Sen, the present Director-General of FAO, was born in India in 1898 and educated at Calcutta and Oxford Universities.

He joined the Indian Civil Service in 1922 and has held many important posts in the Bengal and Central governments, including the secretaryship of the Central Food Ministry, and was Director-General of Food in the Government of India from 1943 to 1946.

Mr Sen went to Washington as Minister in the Indian Embassy in 1947 and later diplomatic assignments included Ambassador of India to Italy and Yugoslavia (1950-51 and 1953-54), to U.S.A. (1951-52), and to Japan (1955-56). He represented India at several international conferences and led Indian delegations to United Nations General Assembly, Security Council, and other meetings. Mr Sen represented India at the fourth, fifth, and sixth sessions of FAO Conference and at the ninth, twelfth, and sixteenth sessions of the Council of FAO. He became vice-chairman of the Council in 1949 and was elected Director-General in November 1956. He was reappointed for a further term in 1959.

Mr Sen has said that he regards his present job as the most challenging and potentially the most rewarding of his career.

New Zealand had been provided for 68 agricultural officers up to 1 March 1960. Countries represented were: Singapore, the Philippines, Pakistan, Malaya, Laos, Indonesia, India, Ceylon, Burma, Japan, and Nepal.

The pressing need for agricultural development in Asian countries is emphasised by the fact that 12 students from Colombo Plan countries have completed the Diploma of Agriculture course and 50 are completing university courses.

During his visit to New Zealand the Director-General of FAO was able to gauge the scope of the technical assistance being given, the facilities available for doing this, and results which had been achieved on farms here by the application of results from field and laboratory investigations.

AT RUAKURA

Ruakura Animal Research Station, like much of the Waikato, was reflecting a very favourable season at the time of Mr Sen's visit. Its paddocks and the herds and flocks combined to demonstrate most strikingly New Zealand's reliance on livestock fed on grass.

The extent to which under an extremely favourable climate this

50th Jubilee Issue of "Journal", June 1960

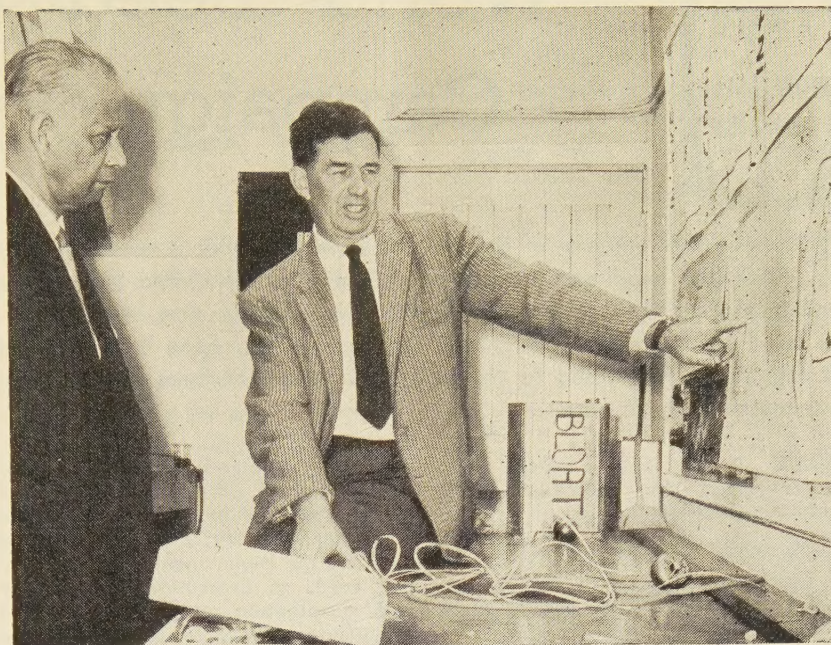
THE completion of 50 years of publication of the "Journal" this year is to be marked in the June issue, which will have many special features of historical interest.

The state of farming in 1910, when the "Journal" first appeared, is reviewed, and other articles deal with the development of many aspects of agricultural research and extension and changes in farm management techniques as reported in the "Journal" over the half-century.

Subscribers will receive this special issue in the usual way. A keen demand for extra copies is expected, and it would be appreciated if orders for these could be placed in advance so that printing arrangements can be made. Additional copies at 1s. each (post free) may be ordered from the Publications Section, Department of Agriculture, at Auckland, Wellington, and Christchurch.

The July and August "Journals" will also contain small supplements reviewing the "Journal's" reporting of agricultural research and development of farming.

VISIT OF DIRECTOR-GENERAL OF FAO



[D.S.I.R.]

Bloat is a serious problem for dairy farmers in various parts of the world. In the forefront in studies of this problem is the Plant Chemistry Division of the Department of Scientific and Industrial Research, whose director, Dr A. T. Johns, is shown explaining to Mr Sen results of his investigations.

combination can be exploited to produce increasing quantities of animal foods was explained to Mr Sen by Dr C. P. McMeekan, Superintendent of Ruakura, during inspections of some of the principal experimental areas.

On portion of an area where meat production under various systems of stocking with sheep and cattle is being studied Mr Sen saw a typical flock of Romney ewes used for fat lamb production by mating with Southdown rams. Dr McMeekan explained the standard practice among fat lamb farmers of bringing in five-year-old ewes from hill country on to fattening farms where they were mated and reared their lambs. He said that average production of carcass meat per acre in the experiment had been similar with various combinations of stocking with sheep and cattle—about 250 lb per acre.

Dr McMeekan emphasised that the aim was to determine the best use of the feed available, which was grass alone. This no doubt impressed on Mr Sen the great dependence in New Zealand on pastures for livestock farming.

This was again heavily accented when the visitor was taken on to a dairy unit where the performance of herds under controlled and uncontrolled grazing was being compared. Mr Sen was told how butterfat production on commercial dairy farms had been raised very substantially even in the last 30 years, how 250 lb per acre

was now commonly achieved, and that at Ruakura production exceeded 400 lb per acre.

At another dairy unit Mr Sen was given further insight into New Zealand's constant search for greater efficiency in production of animal foods. Here he saw the study of aspects of the actual milking process. Mr Sen was shown milk flow recording equipment and a device for measuring udder pressure. This special equipment was designed by scientists at Ruakura.

Bridging the gap between what is achieved in scientific institutions and by farmers is obviously a problem to which the Director-General of FAO must give much thought. Dr McMeekan explained how the Ruakura Farmers' Conference had been organised to give farmers opportunity to see and hear about research work. This annual conference enabled officers to be freed of interruption to their research work at other times, which before the holding of the conference had been an embarrassment.

Mr Sen was most impressed by the meeting and lecture facilities provided in the Ruakura Farmers' Hall, a substantial part of the cost of which was met by farmers and farmers' organisations. He was told how beside being the chief forum for the Ruakura Farmers' Conference the hall had become the venue for many annual meetings of farming and scientific organisations.



World Seed Campaign

PRODUCTION and use of seed of the highest quality is recognised by FAO (the Food and Agriculture Organization of United Nations) as fundamental to the achievement of the organisation's aims. Accordingly, the last FAO conference designated 1961 as a World Seed Year. Already 70 countries have agreed to participate and in 59 of them national programmes have been begun.

SOME of the tasks which it is envisaged this campaign might undertake include:

1. National seed campaigns.
2. Publicity relating to the production, improvement, and use of high-quality seeds.
3. Encouragement of specialised training in various aspects of crop and tree improvement, including seed production.
4. Encouragement of research into improvement of crop and tree varieties.
5. Encouragement of commercial activities in production and distribution of seed of high quality.

In New Zealand the principles of this five-point programme have long been expressed in the policy of the Department of Agriculture. For almost 50 years the Department has offered to test seeds to determine their purity and germination and for 30 years it has conducted a scheme to certify the strain, variety, and, where appropriate, freedom from disease of the major farm seeds used in New Zealand. More than 25 years ago the Department of Scientific and Industrial Research began its programme of selection and breeding to make additional advances in the strain quality of New Zealand's pasture and crop seeds. There is also a certification scheme for certain vegetable seeds.

The importance of using seeds of the highest quality has also been emphasised in the day-to-day advisory work of the Department.

A world seed campaign may not provide any great benefit to New Zealand, but the Deputy Director-General of FAO makes the following suggestions in connection with New Zealand's participation in a recent letter:

"In the international field . . . the Government of New Zealand could make an excellent contribution to the World Seed Campaign by assisting in encouraging less advanced countries in their efforts to develop a more extensive use of high quality seed of improved varieties in order to increase their food production and improve the quality of their agricultural products".

Accordingly, New Zealand has offered to give assistance in the technical training of representatives of under-developed countries in seed and crop improvement and to provide publicity material based on its own experiences which might assist other countries with the conduct of national seed campaigns.

Seeds are important for the sowing of pastures; for the provision of forest, plantation, and farm trees; for the production of cereals and their stored products; for use by commercial and home gardeners for a plentiful supply of fresh vegetables; and for growing flowers and shrubs for ornament. For whatever purpose seed is to be used it is most important that it should be of the highest standard in strain quality, germination, and purity.

100 Years of Seed Growing

Testimony to the importance in an agricultural economy of the provision of an efficient commercial seed production service is given in an excellently produced booklet that has been published to celebrate completion this year of 100 years of business by F. Cooper Ltd., seed merchants with headquarters in Wellington and branches, dressing plants, and trial areas in other parts of New Zealand.

Illustrative of the way firms engaged in the seed trade have marched with the rapid expansion of agricultural and horticultural production, the booklet describes, with a restrained text and excellent illustrations, the large-scale organisation of seed production to high standards.

Embarking early on a programme of domestic production of basic agricultural seeds, the firm's growing business entailed careful selection of contract growers, continuous technical advice, and efficient harvesting, cleaning, and testing, particularly of garden and cannery peas, in the export of which the firm has been prominent. In its development of varieties of garden pea seeds the firm has promoted an export trade of considerable value to New Zealand and won for itself considerable recognition overseas.

The firm is to be congratulated not only on its growth and achievements since young Frederick Cooper established his modest business in Wellington in 1860, but also on the production of a booklet that in its quality and scope presents so well the integral part seed production as a business enterprise has played in the development of the country's economy.

Careless Inoculations Cause Losses through Downgrading

DAMAGE done to carcasses and pelts by careless inoculations has caused concern to freezing companies for some time. The consequent downgrading is "not only an economic loss to the Dominion, but it must also be reflected in schedule values", according to an official statement by the North Island Freezing Companies' Association. "It is therefore in everyone's interests to carry out inoculations carefully. . . .

"Freezing companies definitely prefer and are recommending that inoculations be made either

"(a) In the neck forward of the shoulder towards the base of the ear, or

"(b) In the loose skin on the neck above the brisket.

"Inoculations properly performed in either of these areas will avoid damage to carcasses and pelts", the Association states.

Molybdate Topdressing and Animal Health

By I. J. CUNNINGHAM,

Assistant Director-General, Department of Agriculture, Wellington*

MOLYBDENUM is unquestionably a trace element of special interest in New Zealand, because some areas are deficient in it while other areas have too much. On the deficient areas molybdenum must be added as a fertiliser to grow good pastures or crops; on the excess areas there is so much molybdenum in the fodder that stock are poisoned. This excess may get into the grass because the soil is naturally high in molybdenum, or it may get there through careless or unnecessary use of molybdate fertilisers. Thus molybdenum has on the one hand possibilities of benefiting animal production by improving fodder production and on the other hand possibilities of doing harm by poisoning animals.

THE main purpose of this article is to describe the harmful effects of molybdenum on stock, and to show in what places and why molybdate fertilisers should not be used, but first, to make sure that the matter is kept in its proper perspective, the benefits which can result from the proper use of molybdenum are briefly described.

Benefits of Molybdenum

Molybdenum is an essential food for plants, though their requirements are very small. It is needed to convert nitrates into proteins and thus is necessary for plant growth. On soils that are deficient there will therefore be low production of pasture and low production of crops such as turnips and rape. The correct use of molybdate fertilisers on such deficient soils will greatly improve both pastures and crops.

Molybdenum is also an essential food for the bacteria which grow in the nodules on the roots of legumes and which are responsible for taking nitrogen from the air and converting it to a form suitable for use by plants. Fixation of atmospheric nitrogen by clovers is very important in New Zealand grassland economy. Pastures depend in no small degree on the legume nodules to gather the nitrogen needed for growth. Clovers do not grow well on soil that is short of molybdenum and they respond spectacularly to suitable topdressing with molybdates.

There is no doubt that proper use of molybdenum on deficient soils can improve clover growth, increase nitrogen supply for clover and for grasses growing in association, and

raise production of pastures and crops. In other words, molybdenum can in some districts greatly increase the supply of food for stock, and consequently enhance the stock-carrying capacity of the land. W. R. Lobb, Superintendent of the Department of Agriculture's Winchmore Irrigation Research Station, has calculated just what this may mean on the sandstone and clay soils of the lowlands of Waitaki County. He estimates an increase of 60 per cent in stock carrying or a potential improvement of £500,000 annual gross farm income for that county alone. When the potential improvements of all the deficient areas of New Zealand are added, the total possible increase in primary production for the Dominion is likely to be very significant.

Departmental Trials

Obviously molybdenum is an important fertiliser which must be exploited to the full. Farmers can be well assured that its use in New Zealand is being most actively studied. The Farm Advisory Division of the Department of Agriculture is carrying out comprehensive experiments to learn where molybdates should be used. Experimental plots are laid down by farm advisory officers on known soil types, and regular observations are made of growth response to molybdate, with and without lime, phosphate, and sometimes other fertilisers. Some hundreds of trials have already been laid

down throughout the country and more are being laid down.

Results from these experiments, superimposed on a background of knowledge previously obtained from chemical soil tests carried out at the Department's Rukuhia Soil Research Station and from studies by other research groups, are quickly building up in broad outline the picture of molybdenum response in New Zealand.

An article in the "Journal of Agriculture" for December 1953 by E. B. Davies and J. L. Grigg covers most of the existing knowledge. Responses in growth of pasture to molybdate topdressing have been observed in soils derived from greywacke and greywacke alluvium in Southland, Otago, Canterbury, Westland, and Nelson. Recently responses have been obtained on "pakihi" soils in west Nelson. In the North Island responses have occurred on soils derived from greywacke on the Rimutaka, Tararua, and Ruahine Ranges and on areas as far north as the Bay of Islands. Some sandstones just south of Auckland and in Northland are deficient in molybdenum, as also is Te Kopuru sand in Northland. Practically all soils of the steep country of North Auckland are molybdenum deficient.

The interpretation is that it is desirable and economic to use molybdate fertilisers on these soils.

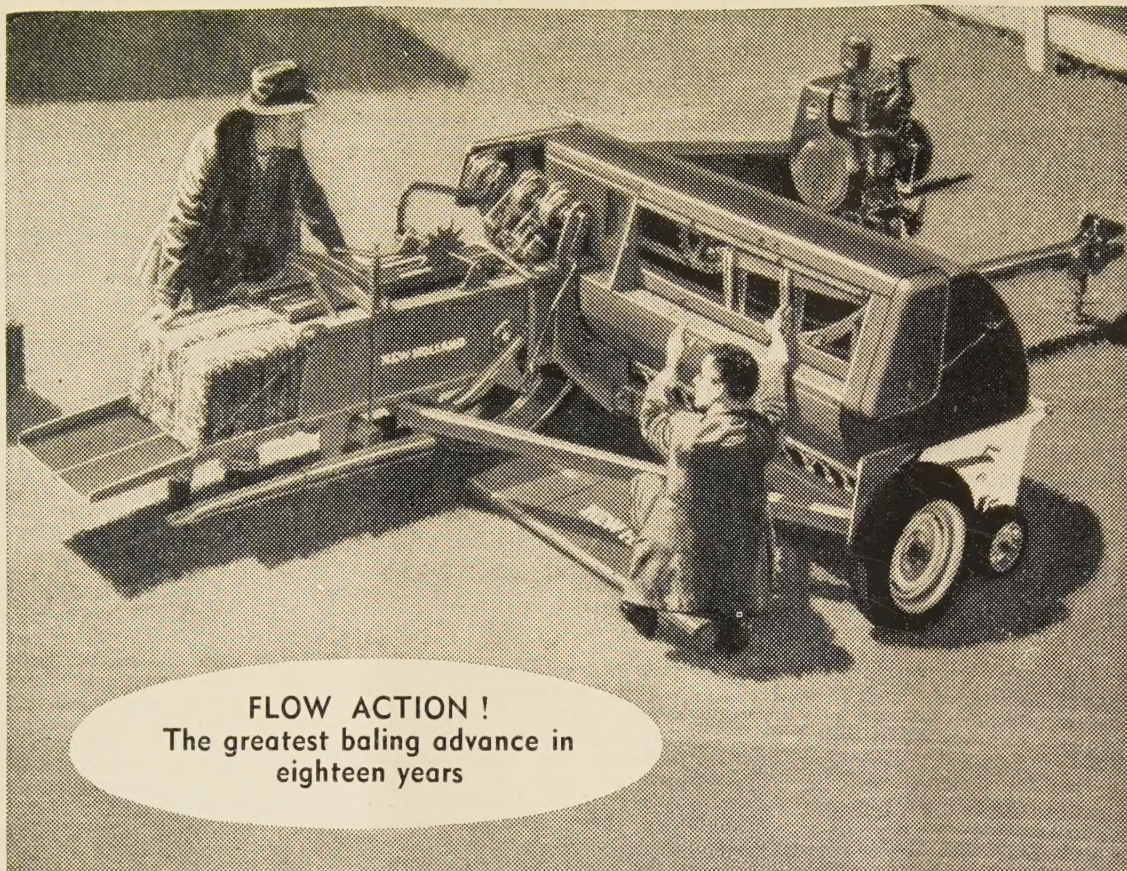
Effect of Lime

Some other studies of molybdenum in soil are of direct interest here. Only a proportion of soil molybdenum is available to plants. Availability is greater near a neutral reaction in soil and decreases as soils become more acid. Liming brings acid soils nearer to neutrality and therefore in certain circumstances will increase available molybdenum. Davies has noted that in some areas very high dressings of lime give unexpectedly high responses in pasture growth and he regards this as due to increases in molybdenum availability. In some places heavy liming may be as effective as applications of traces of molybdenum.

This effect of lime has attracted considerable interest and has led to the belief or hope that molybdenum topdressing will replace liming. Therefore the relation of molybdate topdressing to a liming programme needs some further discussion.

Lime is used to reduce soil acidity, to improve soil structure, to release some plant foods from the soil, to tie up certain substances harmful to plants, and to provide a plant food,

* Revision by Wallaceville Animal Research Station of original work by Dr Cunningham when he was Superintendent at Wallaceville.



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calcium. Incidentally, reducing acidity of soils may increase availability of molybdenum and thus produce an effect greater than would be expected from lime alone.

In some quarters this possible secondary effect of liming on molybdenum supply is being mistaken for the whole effect of liming. It is hoped that the use of ounces of molybdenum per acre will replace the cost and difficulty of applying hundredweights or tons of lime per acre. Obviously this will not be true in most cases, but in limited areas molybdenum can replace lime or reduce the amount of lime which must be used for pasture improvement.

It is clear then that there are two very valuable and economically important results from using molybdate fertilisers:

1. To increase pasture and crop growth.
2. To replace some of the lime needed for pasture improvement.

These results are, of course, obtained only where a molybdenum deficiency occurs.

Danger of Excess Molybdenum

The whole story has a strong appeal to the imagination of farmers. It is exciting to think that more grass can be made to grow by spreading something like a few handfuls of material over the whole farm. It has an appeal to the pocket as well. Also it is not uncommon in farming circles to attribute production failures to lack of a trace mineral, and molybdenum is a trace mineral which appears to do just the right things. The consequence is an urge to use molybdenum fertilisers at increasing rates and on any area irrespective of whether there is or is not a molybdenum deficiency. Unfortunately this brings in the other side of the picture. If molybdenum is used in excess or if it is used on land that is already high in molybdenum, the harmful effect on stock may be very serious indeed.

Poisonous effects from molybdenum have been observed in Britain, California, Florida, Ireland, Canada, and New Zealand. This article is confined to experience in this country.

Role of Copper

To make clear what happens it is necessary to explain first that molybdenum and copper are antagonistic to each other in the animal body. Molybdenum is poisonous, but within limits copper neutralises this poisoning. If copper in the food is low, a comparatively small amount of molybdenum is poisonous, but if copper is normal, the amount of molybdenum necessary to cause symptoms of poisoning is a great deal higher. The relative amounts of copper and molybdenum in the food are therefore predominantly important in determining the occurrence of molybdenum poisoning. An attempt is

made to illustrate this in Fig. 1. This illustrates four sets of circumstances, with the pasture copper shown as a clear column and alongside a black column representing the minimum amount of molybdenum which is poisonous in the same pasture. For a pasture with 10 parts per million (p.p.m.) of copper there must be 20 p.p.m. or more of molybdenum to cause poisoning. For lower levels of copper the minimum harmful level of molybdenum is lower. When pasture has 5 p.p.m. of copper, molybdenum is toxic at only about 7 p.p.m., and when pasture copper is 3 p.p.m. molybdenum is toxic at 3 p.p.m. These figures are not to be regarded as final, but as a general indication reached from field and experimental observations.

Much of the knowledge of molybdenum poisoning in New Zealand relates to peat scours, which is caused by pasture the composition of which conforms to the two middle sets of symbols in Fig. 1. The copper in the grass is between 5 and 7 p.p.m. and molybdenum varies from 7 to 14 p.p.m., that is, just enough to be poisonous.

The effect of this poisoning in stock is marked. Cattle scour severely and persistently in spring and sometimes in autumn. They lose condition and production falls. Young animals do not grow properly and bones are brittle and many have fractures from quite small knocks. The type of scouring is illustrated in Fig. 2.

Proof that molybdenum is the cause of these symptoms follows from:



Fig. 2—A typical case of peat scours caused by molybdenum poisoning.

MOLYBDATE TOPDRESSING



Fig. 1—Pasture levels of copper and molybdenum at which molybdenum is harmful to stock.

1. The occurrence of a seasonal variation of molybdenum content of the pasture with peak molybdenum content at seasons when scouring occurs.
2. The reproduction of symptoms by dosing molybdenum to cattle and by grazing cattle on pastures top-dressed to reproduce the levels of copper and molybdenum that occur in natural cases.

However, molybdenum poisoning is not confined to peat scours. Continuing investigations have shown that in cattle and sheep too much molybdenum in the diet will wash out stores of copper and produce a copper deficiency. An example of what happens in sheep is given in Fig. 3, which summarises the results with a group of 12 ewes kept on grass with copper content of around 10 p.p.m. and dosed regularly with molybdenum so that the molybdenum intake represented about 30 p.p.m. of the food eaten.

The dosing started in October 1945 and continued until 1950. The thick black line is the average amount of copper in the ewes' livers, measured on small pieces of liver removed at

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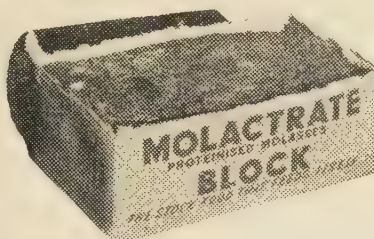
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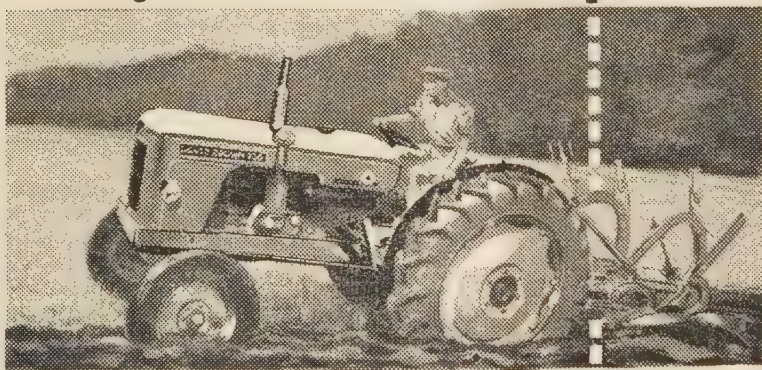


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different times. The steady drop in copper content of the ewes' livers is clearly evident. The black stepped symbols indicate the copper contents in livers of new-born lambs; these are enclosed in a dotted column which shows the normal values for lambs' livers at Wallaceville. Even in the early part of the experiment some of the new-born lambs from ewes dosed with molybdenum had low copper contents in their livers, and at the end of the experiment all such lambs had very low copper in the livers.

The same train of events occurs with cattle. Ten yearling heifers were kept on pasture containing about 10 p.p.m. of copper. Five of these were dosed with molybdenum to give about 30 p.p.m. in the food. At the end of 81 weeks the untreated cattle had on the average 96 p.p.m. of copper in the dried liver, whereas the dosed cattle had only 10 p.p.m. of copper in the liver. Dosing with molybdenum had obviously greatly reduced the amount of copper in the livers of these cattle.

Investigations have also shown that diseases resulting from copper depletion and associated with excessive molybdenum in the pasture occur on other soils beside peat soils. On Omihi soil and other soils in North Canterbury ataxia in lambs occurs and Merino sheep lose wool crimp. The pastures contain about 5 p.p.m. of copper and about 9 p.p.m. of molybdenum.

On pumice soils between Lake Waikaremoana and Wairoa young cattle are copper deficient and unthrifty and show a marked loss of coat colour. The pastures have about 7 p.p.m. of copper and nearly 20 p.p.m. of molybdenum. A similar condition affects cattle in Raglan County. The appearance of the Wairoa cattle is illustrated in Fig. 4.

All these circumstances show clearly that excess molybdenum is extremely dangerous to stock health. Great care must therefore be exercised when this element is used as a fertiliser. However, a warning to be careful is not by itself very helpful, and it is necessary to be specific about:

1. The areas where molybdenum content of pasture is so high that molybdate fertilisers should on no account be used.
2. The areas where copper in pasture is low, because in these areas increases of molybdenum in pasture are especially likely to be harmful.
3. The areas where molybdate topdressing produces an abnormally high response in molybdenum content of pasture. In such areas a small dressing might convert a safe pasture to a dangerous one.

Some information on the first two points had already been accumulated, but this had to be expanded to give a reasonable cover of the Dominion. To do this quickly and with the facilities

MOLYBDATE TOPDRESSING

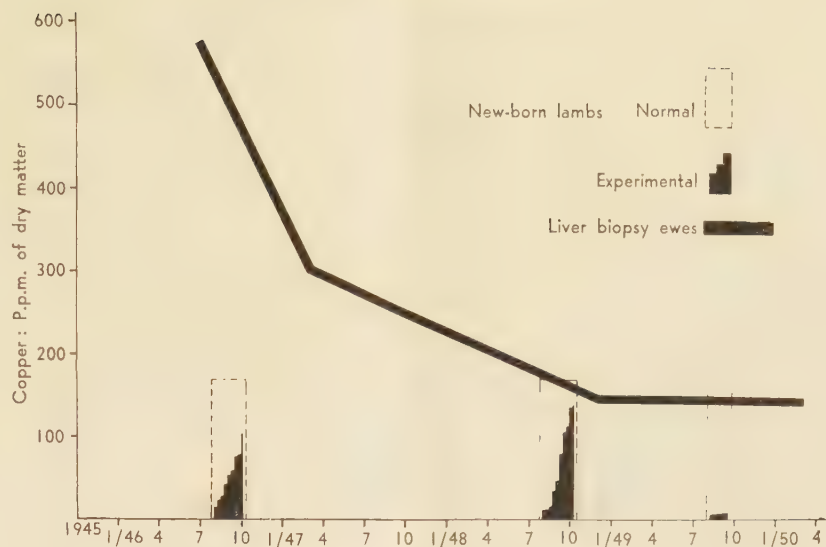


Fig. 3—Graph showing how molybdenum in the food reduces liver copper in ewes and their lambs.

available it was necessary to have some basis for generalisation, and for this soil type was selected. Samples of pasture were collected from all the main soil types in New Zealand in the spring of 1953, and were augmented in subsequent years, since spring is the season for maximum level of molybdenum in pasture. Analyses of these pastures for copper and molybdenum show which soils grow pastures high in molybdenum and which grow pastures low in copper.

The results of this work are discussed here.

For measuring the response in pasture molybdenum to molybdate topdressing two methods were used. The first was to collect experience from a variety of topdressing trials with different rates of topdressing. The second was to obtain pasture samples from trial plots laid down by farm advisory officers to measure response in pasture growth rate to molybdate dressings. From each trial a sample



Fig. 4—Loss of coat colour in an Aberdeen Angus calf owing to molybdenum poisoning.

MOLYBDATE TOPDRESSING

TABLE 1—SOILS THAT GROW PASTURE WITH MORE THAN NORMAL MOLYBDENUM

*Soil name	N = Normal	M = Moderate	H = High	Soil No.	Number of samples	Pasture class	Molybdenum p.p.m.
North Island							
Manawatu set				1	25	N-M	1.6
Pakipaki coarse sandy loam ***				1a	1	M	4
Tukituki set				1c	5	M	4.7
Kairanga set				2	16	N-M	1.7
Opiki complex				2b	3	M	3.8
†Rotomahana sandy loam				3	6	M	4.8
†Otakiri gravel well drained phase				5a	2	N-M	1.4
†Otakiri complex				5c	2	M	3.4
Konoti clay loam				7b	1	M	4.6
Matapiro silt loam **				8	4	N-M	1.7
Matapiro hill soils **				8H	1	M	5
Manawahe gravel				14d	3	N-M	2.4
Awakeri complex				15b	9	N-M	1.3
(Tuai coarse sand ***)				18	8	M-H	5.11
(Tuai hill soils ***)				18H	5	M-H	4.11
†(Tiniroto loamy sand ***)				18a	9	N-M	2.5
†(Tihoi sand ***)				18b	4	M	3.7
†(Tihoi-Opa complex ***)				18b	3	M	4.7
Rangipo sand				18c	8	N-M	1.3
(Tiniroto sandy loam ***)				18g	9	N-M	2.16
(...) sandy silt (Taumarunui district)				19	2	M	6.7
Ngaroma sandy silt				19	8	N-M	1.7
Ngaroma hill soils				19H	3	N-M	2.7
Taumarunui hill soils				19aH	2	M	7.9
Manunui sandy silt				19d	3	N-M	2.3
Mamaku sandy silt				20	2	M	3
Waikoa sandy loam ***				21	9	N-M	1.3
Waikoa hill soils ***				21H	7	N-M	1.8
Matawai sandy loam				22	5	M-H	5.12
Kourarau silt loam				25c	4	N-M	1.4
Wairama clay loam				26	1	M	7
Wairama hill soils				26aH	3	N-M	2.5
Tutira sandy loam				49a	7	N-M	1.6
Tutira hill soils				49aH	1	M	6
Whakatane gravelly sand				51a	7	N-M	1.3
Whangamata gravelly sandy loam				53	2	N-M	2.3
Kaipara clay				101	1	M	6
Waipu clay				101d	3	N-M	1.5
†Otonga peaty loam				107b	11	N-M	1.5
Ruakaka set				108b	2	M	3.4
†Ruakaka peat				109	2	M	3.4
†One Tree Point peaty sand				109b	3	N-M	1.4
Meane-Fardon complex				111	2	M	3.5
Takahiwi set				111c	1	M	9
Ahuriri set				112	3	M-H	5.11
Ahuriri set				112a	1	M	7
Ahuriri stony sand				112b	1	M	6
†Taihape silt loam				114a	18	N-M	1.7
Turakina silt loam				114b	11	N-M	1.7
Waitaha sandy loam				114c	7	N-M	2.4
†Mahoeu silt loam				115	15	N-M	1.9
Pahiatua silt loam				115a	7	N-M	1.3
Hangaroa sandy loam				115b	13	N-M	1.11
Waihua stony sandy loam				117d	4	M-H	5.13
Unidentified peat soils from farms where peat scours occur						M-H	1.16
South Island							
Harihari fine sandy loam					2	M	4
†(Huihui sandy loam)					3	N-M	1.3
Kini peaty loam					1	M	1
Motukarara sandy loam weakly saline phase					4	N-M	1.5
†(Omihiri silt loam)					3	M	3.6
Waitapeka peaty silt loam					4	N-M	1.1
Waikakahi complex silt loam					5	N-M	1.7
(Weka sandy loam)					2	M	4.7
Taitapu silt loam					4	N-M	1.3
††(....) terrace soils associated with Onepunga soils					1	M	7

Footnotes to Table 1

* For North Island samples the soil names are those in Soil Bureau Bulletin No. 5, except where more detailed surveys have provided names which are indicated ***. Where such surveys are not yet published the names are enclosed in brackets. In all cases the soil set number from Soil Bureau Bulletin No. 5 is shown for reference.

The general Soil Map of the South Island has not yet been published and soil names are taken from district surveys. Where the surveys are not yet published the names are enclosed in brackets. (...) indicates that a soil name has not yet been allotted, and in such cases the texture is given and the district of origin shown in brackets after the texture.

** Pastures from these soils on one farm in Valley Rd. district, Hastings, have much higher molybdenum content than the same series in other districts. Though no physical differences occur, the soil molybdenum is higher for this soil type than in other areas.

† Some samples low in copper have also been taken from areas of these soil types.

† Spring sample only: Numerous others from same farm throughout the season.

came from the untreated area, from the area topdressed with molybdate, and from the area topdressed with lime and molybdate.

In assessing the results of surveys or of topdressing the following criteria are used to judge the relation to animal health.

Copper—Low: Below 5 p.p.m.

Molybdenum—Normal: Below 3 p.p.m.

Moderate: 3 to 10 p.p.m.
(dangerous if copper low)

High: Above 10 p.p.m.
(potentially dangerous, even with normal copper)

Pastures Moderate or High in Molybdenum

Table 1 lists soils which grow pastures moderate or high in molybdenum without any additions of molybdate fertilisers. Soils which grow pastures containing more than 10 p.p.m. of molybdenum are emphasised by heavy type.

Locations of the soils included in Table 1 are shown by the black patches in Fig. 5.

The list is not final, as further work may modify it. On the North Island list soils derived from Taupo ash require comment. Only the areas of soil of these types near Wairoa are seriously high in molybdenum and on these areas stock disease has occurred. The main bulk of soils from Taupo ash produces a grass normal or moderate in molybdenum. The reason for this difference is a difference in origin of soils of close physical similarity.

Not all farms on soils shown in Table 1 as moderate in molybdenum will have 3 or more p.p.m. in the pasture. Nevertheless these soils must be regarded as possibly dangerous and except where it may be recommended in exceptional cases by farm advisory officers molybdenum should not be used. Quite obviously molybdate fertilisers should on no account be applied on any of the soils known to be high in molybdenum.

Pastures Low in Copper

Table 2 lists the soils that produce pastures low in copper, and the locations of these soils, with certain others consisting of peat, peat-pumice, or peat-sand mixtures which may be both high in molybdenum and low in copper, are shown in Fig. 6.

Hukerenui silt loam requires some comment. Ataxia has occurred in lambs on this soil type. Though the copper content of the pasture was slightly above 5 p.p.m., the sample was of necessity taken from an area adjacent to copper topdressed land and could have received some copper contamination. For these reasons it was considered legitimate to include Hukerenui silt loam in Table 2 and Fig. 6.

Generally the soils listed grow pastures with less than 5 p.p.m. of copper, but there is some variation, as is indicated by the figures shown in Table 2, and in some North Island sands (sets 23 and 23b) many of the pasture samples have normal copper contents.

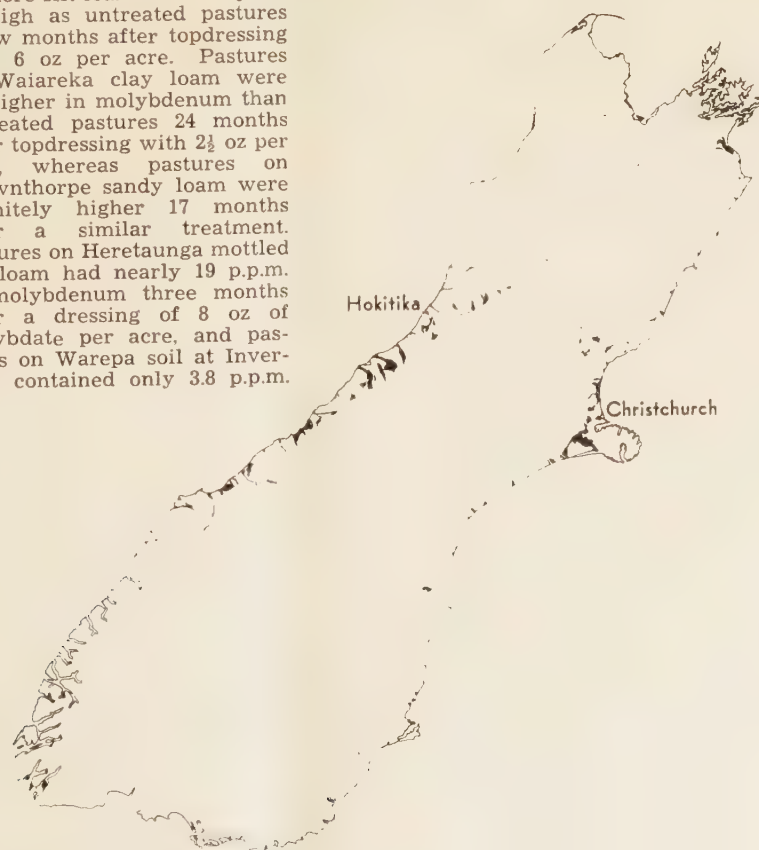
The low copper is not necessarily enough on its own to cause stock disease, but it is so low that topdressing with molybdenum could well bring on trouble in animals. Clearly molybdate fertilisers cannot be used on any of these soils without risk. If molybdenum must be used to secure good pasture growth, copper fertilisers would have to be applied at the same time or copper cerate injections given to protect stock health.

Responses to Molybdate Topdressing

Pastures on different soils respond differently in molybdenum content to a topdressing with molybdate. This is illustrated in Table 3, which shows, for a variety of soils, the molybdenum content of pasture at different intervals after dressings of different amounts of molybdate.

It is apparent from this table that pastures on different soils respond differently in molybdenum content to topdressings with molybdate. For example, 12 months after treatment with 4 oz per acre pastures on Kauru silt loam were six times as high in molybdenum as untreated pastures from the same soil; and pastures on Lismore silt loam were only four times as high as untreated pastures a few months after topdressing with 6 oz per acre. Pastures on Waiareka clay loam were no higher in molybdenum than untreated pastures 24 months after topdressing with 2½ oz per acre, whereas pastures on Crownthorpe sandy loam were definitely higher 17 months after a similar treatment. Pastures on Heretaunga mottled silt loam had nearly 19 p.p.m. of molybdenum three months after a dressing of 8 oz of molybdate per acre, and pastures on Warepa soil at Invermay contained only 3.8 p.p.m.

Fig. 5—The black areas indicate soils which grow pastures high in molybdenum.



from the same topdressing after the same interval.

Some pastures reach a high level of molybdenum from comparatively small dressings of molybdate. Two ounces of molybdate per acre raised pastures on Heretaunga mottled silt loam to 6.9 p.p.m., and three dressings of 2 oz within two years raised sandy soils on Flock House to 11 p.p.m. This dressing of three lots of 2 oz in two years is higher than would ever be recommended, but not higher than might be applied by careless farmers.

Table 3 thus shows two things. High or repeated dressings with molybdate will raise pasture molybdenum to dangerous levels, and responses on different soils are very different. Because of these different responses it was necessary to make measurements on a number of soil types to learn which are the soils on which abnormally high response in pasture molybdenum occurs after molybdate topdressing at usual rates (about 2½ oz per acre).

A content of less than 3 p.p.m. of molybdenum in pasture three months

MOLYBDATE TOPDRESSING . . .

TABLE 2—SOILS THAT GROW PASTURES OF LOW COPPER CONTENT

North Island		South Island	
Soil No.	Copper in pasture p.p.m.	Soil name	Copper in pasture p.p.m.
*Soil name			
Rotomahana sandy loam .. 3	4.1 - 11.0	(Cheviot silt loam) ..	2.8
Tarawera gravel .. 5	3.7 - 9.0	Eyre soils including shallow and stony silt loam ..	3.8 - 8.1
Otakiri gravel well drained phase .. 5a	3.9 - 4.6	(Glasnevin shallow sandy loam) ..	2.5 - 7.0
Awakeri set .. 15	4.0 - 5.8	(...) silt loam (Hawarden district) ..	4.8
Taupo sand .. 18	3.9 - 8.9	(Huihui sandy loam) ..	4.1 - 6.3
(Tiniroto loamy sand ***)	4.7 - 9.0	Hororata stony silt loam and shallow loam ..	4.6 - 7.7
(Tihoi sand) .. 18b	4.2 - 6.3	Lismore soils (shallow and stony silt loam)	4.2 - 6.2
Mohaka sandy loam .. 21a	3.1 - 11.0	Mayfield silt loam ..	4.5 - 9.5
Patea sand .. 23	3.6 - 10.4	Mapua clay formation ..	4.3 - 4.5
Whananaki sand .. 23b	4.1 - 12.0	Oamaru complex ..	3.7 - 5.0
Marsden sand .. 23c	2.8 - 8.0	Omaka gravelly loam (Omihiti silt loam) ..	4.0 - 9.3
Red Hill set .. 24a	2.8	(Onehunga gravelly loam ***)	4.3 - 7.3
Purimu hill soils .. 31dH	4.8	(...) terrace soils associated with Onehunga soils ..	3.2 - 5.7
†Hukerenui silt loam .. 46bH	5.1	(...) clay and sandy loam (Ohai district)	4.7 - 7.7
Wharekohe silt loam .. 47	4.5 - 8.6	Opuha hill soils ..	3.4 - 4.7
Te Kopuru sand .. 47d & 47dH	1.1 - 4.9	Otanomomo peat ..	3.7
Whakatane gravelly sandy loam .. 51	3.2 - 6.6	Temuka silt loam ..	4.8 - 9.5
Otonga peaty loam .. 107b	3.9 - 10.2	Waimea clay loam ..	4.8 - 9.5
Ruakaka peat .. 108b	1.7 - 8.5	Warepa silt loam ..	4.4 - 15.4
Ruakaka peat .. 109	1.7 - 8.5	(Weka clay and sandy loam) ..	3.9 - 5.7
One Tree Point peaty sand .. 109b	1.7 - 10.9		
Pukeokahu silt loam .. 113b	4.5		
Taihape silt loam .. 114a	4.4 - 10.8		
Mahoenui silt loam .. 115	4.7 - 14.0		
Pohangina sandy loam 118a	4.8		
Unidentified peats where peat scours occur ..	1.7 - 10.2		

* See footnotes Table 1.

† See text page 424.

after topdressing was regarded as a normal response. A content of 3 p.p.m. or more of molybdenum in pasture three months after topdressing was regarded as an abnormally high response.

Information on this aspect, as already explained, was obtained by examining pasture samples from farm advisory officers' trials. Results are shown in Tables 4 and 5 and are discussed under the two headings which follow.

Pastures Showing Normal Responses

Soils which grow pastures containing less than 3 p.p.m. of molybdenum

three months after topdressing are shown in Table 4. This table does not show where molybdate should be applied to obtain more grass or better crops on individual farms. This can only be decided after consultation with the local farm advisory officer. It does, however, indicate those soil types on which molybdenum can safely be used wherever it is profitable to do so.

Pastures Showing Abnormally High Responses

The first important point shown in Table 5 is that North Island soils respond more in molybdenum content of pasture to molybdate dressings than do South Island soils.

TABLE 3—EFFECT OF TOPDRESSING WITH MOLYBDATE ON MOLYBDENUM CONTENT OF PASTURE

Soil	Topdressing		Molybdenum p.p.m. in dry grass	
	Rate/acre	Months since application	Untreated	Topdressed
Peat	5 oz once	14	2.3	27
	14 lb once	14	2.3	300
Sand at Flock House	2 oz three times	24 since first	Less than 1	11
Crownthorpe sandy loam	2½ oz once	17	0.5	2.0
Kaura silt loam	4 oz once	12	1.2	6
Walareka clay loam	2½ oz once	24	Less than 1	Less than 1
Lismore silt loam	6 oz once	3	0.5	2
Heretaunga mottled silt loam (Wallaceville)	1 oz once	3	1.4	4.3
	2 oz once		1.4	6.9
	4 oz once		1.4	12.2
	8 oz once		1.4	18.6
	1 oz once	3	1.0	1.4
Warepa silt loam (Invermay) ..	2 oz once		1.0	1.1
	4 oz once		1.0	2.6
	8 oz once		1.0	3.8

TABLE 4—SOILS WHICH GROW PASTURE WITH LESS THAN 3 p.p.m. OF MOLYBDENUM THREE MONTHS AFTER TOPDRESSING (COPPER ABOVE 5 p.p.m.)

*Soil name	North Island	Soil No.
Waipunga set (except district)	Pakipaki	1a
Motatau clay		7a
Waipukurau sandy loam		9b
Tokomaru silt loam		13
Milson silt loam		13a
Halcombe hill soils		13bH
Horea set		24d
Horea hill soils		24dH
Wanstead clay loam		25a
Mangatea hill soils		25H
Mangaotaki hill soils		29aH
Marua hill soils		35H
(Judgeford hill soils ***)		35bH
Tauwhare hill soils		44eH
Waikare clay		45
Waikare hill soils		45H
Maungatawhiri fine sandy loam ..		46d
Maungatawhiri hill soils		46dH
Hangawera hill soils		46eH
Te Kuiti sandy loam		60a
Aria silt loam		60b
Te Akau set		61c
Ohakune hill soils		65H
Westmere silt loam		66d
New Plymouth hill soils		67bH
Stratford sand		68
Levin silt loam		75
Takapau silt loam		76
(Belmont silt loam ***)		76aH
Matamau hill soils		77bH
Dannevirke silt loam		78b
Tahuna clay loam		84c
Churchill set		86a
Pakotai clay		90C
Kerikeri friable clay		96a
Rahotu loam		100b
Kaitaia clay loam		101b
Bluff loam		113
Whangaeu set		114
Whangamomona complex		116
Makara stony loam		122
Moeatoa set		122a
Ruahine set		124
Kaweka sandy loam		125

South Island

(Aparima silt loam ***)
 Ashley silt loam
 (Blackstone stony loam ***)
 (...) hill soils (Collins district)
 Chertsey shallow silt loam
 Claremont silt loam
 Clydevale silt loam
 Hokitika gravelly sandy loam
 Glenroy silt loam easy rolling phase
 Jordan silt loam
 (Kaiwera Hill soils ***)
 (Karwere silt loam ***)
 (Karitane silt loam ***)
 Lyndhurst silt loam
 (Mokotua silt loam ***)
 Opuha silt loam
 Oxford silt loam
 Paparua stony sandy loam
 Barrhill silt loam
 (Ranfurly stony loam ***)
 Ruapuna very stony silt loam
 Wakanui silt loam
 (Takahe loam ***)
 Tasman silt loam
 (Tautuka silt loam ***)
 (Te Houka silt loam ***)
 Timaru silt loam
 Waimakariri silt loam
 Wangaeoa stony sandy loam and clay loam
 (Wharetoa silt loam ***)

* See footnote Table 1.

Seventeen soils in the North Island gave pastures with molybdenum content 3 p.p.m. or higher three months after topdressing.

In the South Island one pasture from an area bordering Lake Ellesmere showed an abnormally high response and this was from a soil (Motukarara sandy loam) which produces high molybdenum pasture even without topdressing. A pasture molybdenum figure approaching 3 p.p.m. four months after molybdate application and a history of scouring in cattle which followed the topdressing but was apparently cured by copper suggested that a similar Lake Ellesmere soil (Taumutu shallow stony sand) should also be included in this group.

The distribution of the 17 North Island soils in Table 5 is mapped in Fig. 7. The South Island soils are not mapped because they are included among the soils in Fig. 5.

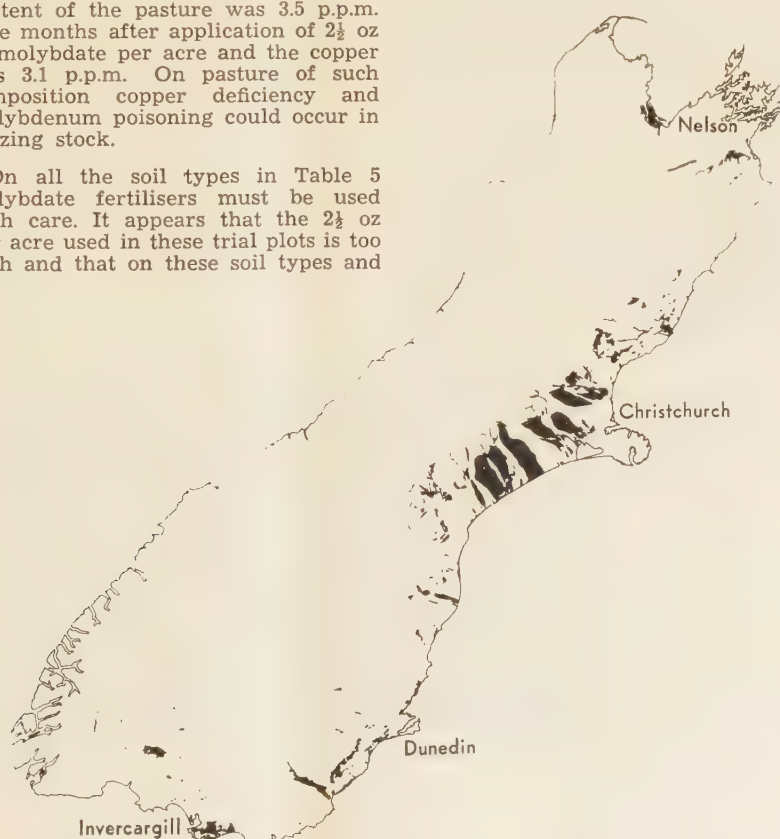
Of the 17 North Island trials that gave a high response in molybdenum, four were in pastures that are low in copper. In these pastures a rise of molybdenum is more likely to be dangerous.

On only one of the soils was the pasture growth so improved by molybdate topdressing that the farm advisory officer would recommend using molybdate fertiliser. This was Te Kopuru sand. But this is an important case, because copper in the pasture is very low. The molybdenum content of the pasture was 3.5 p.p.m. nine months after application of 2½ oz of molybdate per acre and the copper was 3.1 p.p.m. On pasture of such composition copper deficiency and molybdenum poisoning could occur in grazing stock.

On all the soil types in Table 5 molybdate fertilisers must be used with care. It appears that the 2½ oz per acre used in these trial plots is too high and that on these soil types and



Fig. 6—The black areas indicate soils which grow pastures low in copper.



indeed on the North Island generally a lower level should be used to guard against stock disease. For soil types

TABLE 5—SOILS GIVING PASTURE WITH 3 p.p.m. OR MORE OF MOLYBDENUM THREE MONTHS AFTER TOPDRESSING WITH MOLYBDATE

*Soil name	North Island	Soil No.
Esk sand		1b
Tarawera gravel		5
Rissington set		11cH
Marton loam		13c
Ohinepanea sand		14c
Patea sand		23
Marsden set		23c
Atua silt loam		29
Te Kopuru sand		47d
Whakatane gravelly sand		51a
Te Kuiti silt loam		60
Hauturu silt loam		62cH
Ohakune silt loam		65
New Plymouth brown loam		67
Pongakawa peaty loam		107f
Moumahaki sandy loam		117
Te Ranga set		122b

South Island

Motukarara sandy loam

†Taumutu shallow stony sand

* See footnote Table 1.

† See text on this page.

MOLYBDATE TOPDRESSING



Fig. 7—Soils of the North Island which after topdressing with molybdate give abnormally high levels of molybdenum in the pasture.

like Te Kopuru sand where low pasture copper accompanies high response to molybdate dressing the only safe procedure would be to combine a copper topdressing with a molybdate topdressing or to give stock copper cerate injections.

On the basis of results discussed in this article it is possible to make specific comments on the use of molybdate fertilisers.

1. All the soil types listed in Table 1 and shown in Fig. 5 at present produce pastures above normal in molybdenum content. Topdressing with molybdate should be unnecessary and would further raise pasture molybdenum with possibility of harm to stock health. On these soils molybdates should not be used.
2. The soil types listed in Table 2 and shown in Fig. 6 produce pastures low in copper content. Topdressing with molybdate is likely to raise the molybdenum content of grass and a raised molybdenum content of grass with low copper is especially dangerous to stock. If

molybdate topdressing is necessary to improve pasture growth, copper topdressing at 5 lb of blue-stone per acre should be applied at the same time to protect stock, or stock should be injected with copper cerates.

3. The soils listed in Table 5 and shown in Fig. 7 give abnormally high responses to a topdressing of $2\frac{1}{2}$ oz of molybdate per acre. Molybdate should not be used at this rate on these soils without concurrent use of copper.
4. The high response to molybdate dressings in a big proportion of the North Island trials (see Table 5 and discussion of it) suggests that $2\frac{1}{2}$ oz per acre is too high for the North Island. It is probable that a lower rate of topdressing would not produce sufficient increase in pasture molybdenum to cause any concern about stock health and yet would produce adequate growth responses in pasture. Responses in the South Island are not nearly as high and on most soils of that island a rate of topdressing with molybdate

higher than in the North Island could safely be used.

The lists of soils commented on in 1, 2, and 3 have been compiled from analyses made in the past five years. All the main soils have been covered, but a few of the less extensive soils may have been omitted. In future years these lists may be extended. Nevertheless the results so far obtained give some assistance in reaching a policy on the use of molybdate fertilisers.

5. The abnormally high responses on some soils to small rates of molybdate topdressing, and the marked response to higher single dressings or repeated dressings (Table 3) point very clearly to the need to adhere closely to recommended rates of molybdate.

Molybdenum a Valuable Fertiliser

Despite the discouraging outlook that these results might engender, they should not in any way be interpreted as suggesting that molybdate is unsafe where a deficiency exists. Molybdenum is a very valuable fertiliser and its correct use can be of great value. Careless and irresponsible use on the other hand can be harmful. This article shows where molybdates should not be used. Farm advisory officers in each district can, if necessary, give farmers information on the soil types on their farms and can tell them where molybdate should be used and the amount it is safe to use.

Shorter Conference at Ruakura This Year

THE 1960 Ruakura Farmers' Conference at the Department of Agriculture's Ruakura Animal Research Station will be held from 14 to 16 June. This year's conference is one day fewer than past conferences. The usual day of papers for all farmers has been deleted and the programme has been adjusted to give more general interest over the whole conference, and particularly to the field day.

The first day will be devoted to papers and discussion of interest mainly to sheep farmers; the second day will be a field day, for all farmers, at Ruakura and at the Whatawhata Hill Country Research Station; and the third day will comprise papers and discussion for dairy farmers.

About 1,000 farmers now attend the lectures in the conference hall at Ruakura, and the well organised field day is particularly popular; it attracted some 6,000 spectators last year.

Paradontal Disease of Sheep in South Canterbury

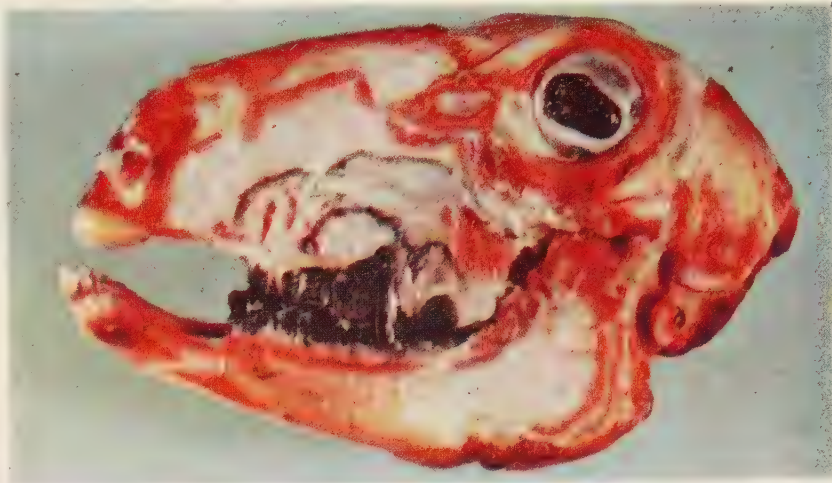
Preliminary Report on Investigations

By M. C. ARMSTRONG,
Veterinarian, Department of Agriculture, Timaru

Paradontal Disease . . .

- ★ Will be a difficult problem to solve
- ★ Has seasonal incidence in South Canterbury
- ★ Gives no evidence of contagiousness or of having a specific infective agent
- ★ Is probably of hormonal, metabolic, or nutritional origin, possibly a mineral deficiency.

DURING recent years veterinarians in the Department of Agriculture have investigated a dental disease of sheep commonly known as pyorrhoea and referred to as paradontosis or enzootic paradontal disease by the veterinary profession. The disease is of comparatively recent incidence and is identified at present in certain districts of South Canterbury and in the Bulls-Santoft district of Manawatu.



▲ An advanced case of acute paradontosis affecting the upper molars and jawbone.

◀ Degeneration and decay extending to the roots of back molars.

PARADONTOSIS is characterised by chronic inflammation in the periodontal membrane of one or more teeth, resulting in pain, looseness of teeth, reluctance to graze, and consequent starvation. In some seasons it may be an important cause of wastage.

Investigations have been largely confined to the Bulls-Santoft area of the Manawatu and to the Fairlie, Pleasant Point, and Morven areas of South Canterbury. Veterinarians in charge of the areas concerned have used research facilities available at the Department of Agriculture Wallace-

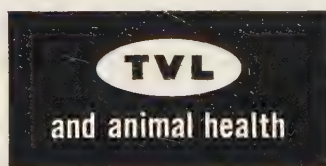


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ville Animal Research Station and the Pathology Department of the Otago University Dental School to define the nature and causes.

First Reports of Disease

Paradontal disease was first investigated in New Zealand by the author and K. G. Gray near Fairlie in 1952. R. M. Salisbury did the laboratory work at Wallaceville and the disease was recorded in the "New Zealand Veterinary Journal" of March 1953 under the name "Ulceromembranous Gingivitis in the Sheep". At that time the disease was considered to resemble Vincent's angina or trench mouth in humans.

First cases were observed in the spring of 1945 when some unthrifty ewes were found diseased in the mouth when yarded for drenching. No more cases were observed until February 1952, when several ewes and some rams became affected. In the 1952 outbreak the disease appeared to arise at the gum tooth margin of molars and/or incisors. There was ulceration of the gum and penetration of the infection down into the alveolus with involvement of all the periodontal tissues and eventual expulsion of the tooth. No specific infective agent could be isolated and the disease could not be transmitted to healthy sheep by contact or by artificial inoculation.

Later Cases

In South Canterbury no more opportunities for investigations were available until autumn of 1958, when the disease was reported in several flocks near Fairlie. During autumn to spring of 1958 this disease was identified on 18 farms in the Fairlie district, one near Pleasant Point, and one near Morven. The incidence varied from 2 to 8 per cent, the highest being about 140 cases in 1,700 sheep. Most cases recover slowly, but affected animals seldom make good sheep. The death rate averages about one in every five affected.

Since about 1954 the disease has been observed and investigated in



← Advanced degeneration around a molar tooth and swelling of lower jawbone compared with a normal tooth and jawbone. →



some flocks in the Bulls area of the Manawatu. The disease in the Manawatu differs in minor respects from that in South Canterbury but its basic nature is the same. For instance, in South Canterbury inflammation of the gum margin is observed frequently and the disease affects rams and ewes of various ages from hoggets onward.

It is also seen in the different breeds of sheep peculiar to the farming areas involved. The breeds of sheep affected in South Canterbury have been Romney, Cheviot, Corriedale, Border Leicester, and various crossbreeds. In the Manawatu the flocks concerned are all Romney, the affected sheep are four-tooth or older, and all cases were in ewes except for one ram.

Soil Types

The soil types affected vary greatly from fertile clay downs to low-lying silt loams, to very stony silt loams, and to some sandy soils. There is no apparent relation to soil type or carrying capacity or to the degree of development of the property. Molars and incisors or either molars or incisors may be affected, but the animal declines more rapidly when the molars are affected.

Pathology

Pathological studies reveal localised degeneration and shrinkage of the tissues surrounding the tooth. A

crevice in the gum degenerates to form a deep pocket impacted with food which tends to surround and detach the tooth. In advanced stages inflammation of the jawbone may occur with resultant hard bony swellings which often distort the face. If the tooth drops out, healing occurs, but there is less chance of this occurring with deep-rooted molars. Affected sheep can be recognised by irritation in the mouth causing unusual jaw movements (mouthing), reluctance to masticate, a foul-smelling mouth, missing, loose, or displaced teeth, and perhaps lesions on the gums.

Pathological studies indicate the disease is primarily a bone disease which begins in the superficial tissues and then extends to bone at an early stage. It is essentially localised and does not spread to all teeth. It most commonly affects premolars and molars.

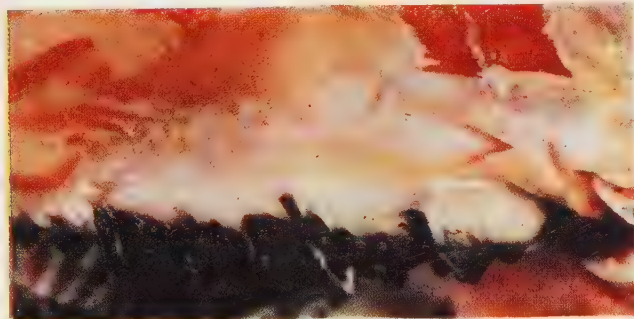
No Infective Agent Found

Bacteriological studies have been unable to find any specific infective agents that can transmit the disease to healthy sheep.

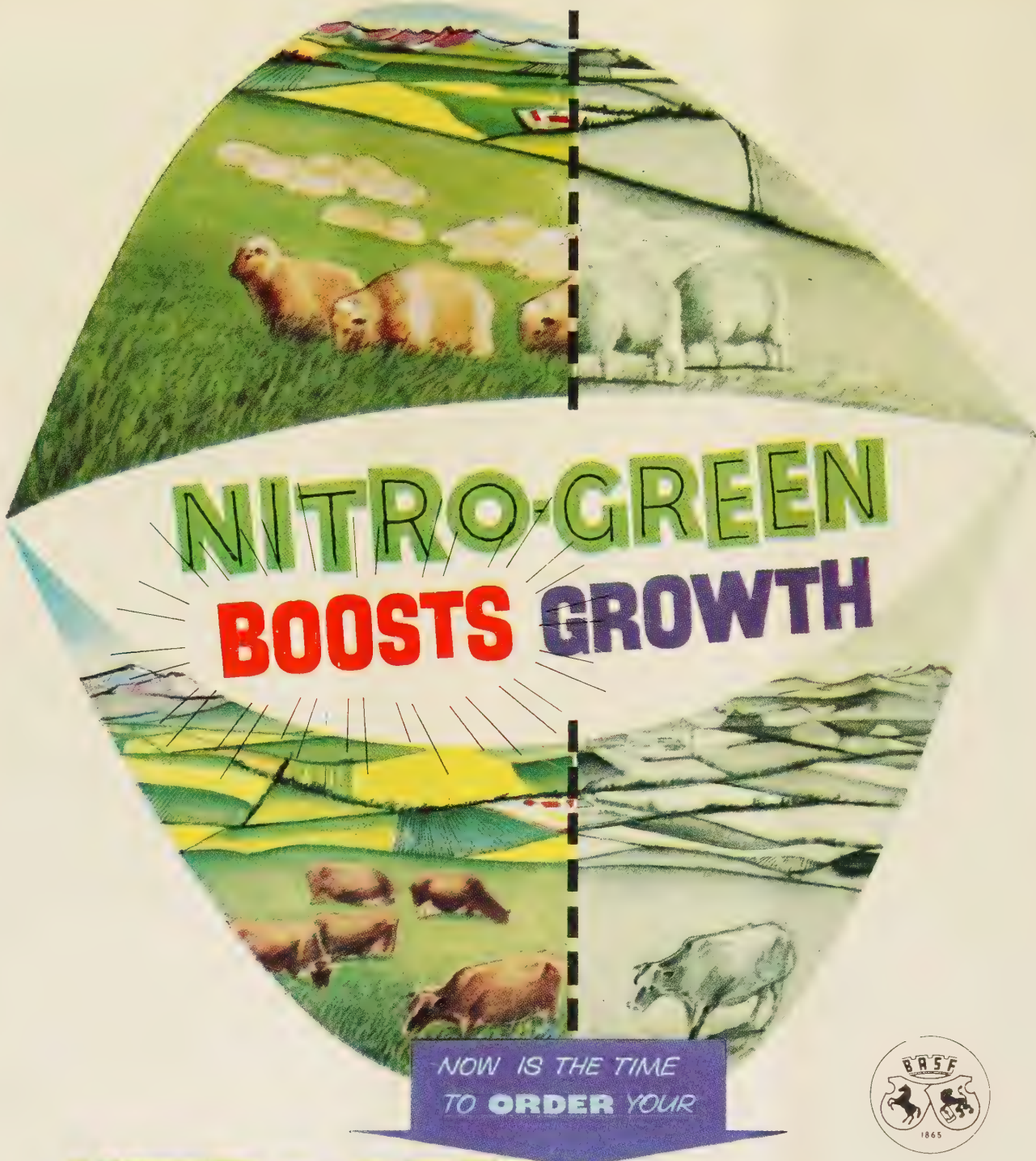
Biochemical studies have revealed no significant findings in the nutritional and mineral field.

Radiographical findings have supplemented and confirmed the pathological picture.

In South Canterbury the disease is definitely extremely seasonal. The 1959 season was remarkable for the almost complete absence of the disease and this is all the more significant because the previous season was the worst ever recorded.



An early stage of paradontosis with a degenerated crevice alongside the molars.



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Manila Animal Health Conference Far East Region Action to Meet Spread of Livestock Diseases

By S. JAMIESON,
Chief Advisory Officer (Infectious Diseases Control),
Department of Agriculture, Wanganui

THE danger of foot-and-mouth disease, rabies, and fowl pest entering New Zealand from the Far East is greater today than ever in our history. That is the impression I formed after attending the Fourth Joint FAO-OIE* Far East Meeting on Animal Health at Manila in December. Lest this statement cause undue alarm it must be added that, as technical services are expanded in the Far Eastern countries where the diseases occur, great progress can be expected in controlling and eliminating them. Meantime New Zealand will have to exercise the utmost vigilance. With other countries so far free of these diseases, such as Australia, we should press for measures which will prevent spread from the areas from which we are threatened and which will lead to their control or elimination.

IT is no exaggeration to say that none of the diseases mentioned is under a safe form of control in the Far East. None of them is likely to be, until greater advances are made in immunisation against virus infections.

To safeguard New Zealand's livestock industry we must concentrate on establishing as watertight quarantine controls as are possible and at the same time prepare to deal with any new animal disease. In the past, time and distance were New Zealand's best defences against the introduction of animal disease. They no longer serve because of the fantastic increase in the speed of air travel and the tremendous growth of this traffic both in passengers and goods.

The importance of keeping countries, such as New Zealand, which are major suppliers of food of animal origin to the rest of the world, free of animal diseases was stressed at the FAO-OIE meeting. Countries such as New Zealand and Australia which have highly developed precautions for avoiding disease can contribute a great deal to inculcating a better understanding of quarantine methods among our Far Eastern neighbours. At present many of them have inadequate precautions.

* FAO, Food and Agriculture Organization; OIE, Office International des Epizooties.

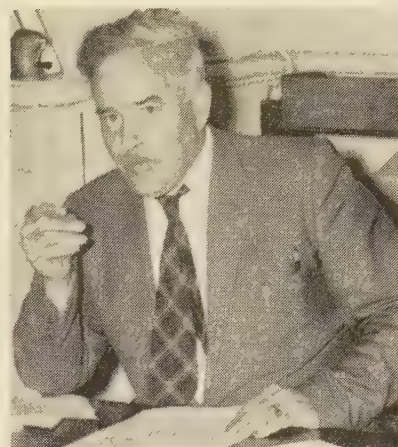
Flying Times to N.Z. from Far East and Pacific

SPEED of air travel and the great increase in this traffic have negated the effectiveness of the barrier of distance as a safeguard to New Zealand's livestock industry in keeping out dangerous infectious diseases of animals. Examples of flying times to New Zealand from the Far East and Pacific are:

From	Hours
Australia	5
Borneo (via Singapore)	19
Fiji	5
Hong Kong	31
Honolulu	19
India	21
Manila	26
New Guinea	16
Norfolk Island	3½
Noumea	6
Pakistan	20
San Francisco	27
Saigon	17
Singapore	12
Tahiti (via Suva to Nandi)	20
Tokyo	12

Times are as quoted by the fastest route in "The ABC World Airways Guide" of April 1959 (including stopovers).

Block flying time can be estimated, with present aircraft, to be 200 nautical miles per hour.

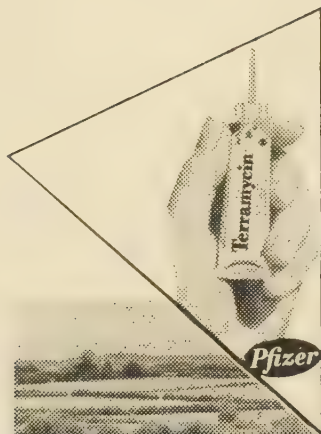


Dr Jamieson.

Recommendations

With the aim of securing stability and uniformity in quarantine procedures and encouraging international cooperation in controlling disease the FAO-OIE conference recommended:

- All countries in Asia and the Far East should issue a bulletin showing monthly occurrence of serious infectious livestock disease.
- In cases of emergency, countries should notify OIE and neighbouring countries by telegram or other suitable methods.
- Movement of livestock from one country to another should be along mutually agreed routes and be controlled according to veterinary regulations.
- Standard certificates should be used by all countries for animals slaughtered, which must be detained in quarantine in the importing country until slaughtered.
- Animals should be examined, and appropriate certificates issued within 48 hours of export, such certificates to be signed only by authorised Government veterinary officers.
- In addition to restrictions imposed by importing countries, exporting



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countries should take precautions to ensure that only healthy animals are exported.

ACTION TO MEET SPREAD OF DISEASE

CHIEF THREATS

Chief threats to New Zealand, at present free of serious infectious livestock diseases, are foot-and-mouth disease, rabies, and fowl pest, but the conference discussion of rinderpest was also of considerable importance to us.

Foot-and-mouth Disease

Foot-and-mouth disease exists in the following countries represented at the Manila meeting: Burma, Ceylon, Laos, India, Iran, Iraq, Pakistan, Thailand, Hong Kong, and Venezuela. Malaya had its last outbreak in 1938, Japan in 1933, the U.S.A. in 1929, and Australia in 1872. Netherlands New Guinea, North Borneo, and New Zealand are the only countries where this disease has so far not occurred.

The disease is so well established in the East that control measures are somewhat desultory. Economic or religious grounds prevent adoption of a slaughter policy.

Unless some phenomenal discovery is made which will lead to an understanding of the behaviour and nature of foot-and-mouth viruses it will be many years before the disease can be controlled. This opinion is based on:

1. The appearance of the same virus in countries many thousands of miles apart.
2. The discovery of a virus type in the Pyrenees which is not affected by immunisation.
3. The recent discovery at the Research Institute (Animal Virus Disease), Pirbright, England, of a particle smaller even than the virus which is infective.

Vaccines

The merits of different vaccines were fully discussed at the Manila meeting. It is doubtful if any of the vaccines in production are of permanent use. The two best give an immunity of only three months. The available evidence indicates that if foot-and-mouth disease is to be controlled, effective vaccines will have to be produced locally.

The FAO-OIE conference recommended that in view of the unsuitability of existing vaccines for extensive use in the control of the disease, research should be intensified in an effort to develop a vaccine that is cheap, effective, relatively easy to prepare, gives long immunity, and can be transported satisfactorily in the tropics.

The conference also recommended that in view of the great importance of proper disinfection of all means of transport and materials likely to be



Frothing and salivation are an early symptom of foot-and-mouth disease. The disease is well established in the East, where control measures are desultory.

contaminated by the virus, countries should give special and urgent attention to the introduction and enforcement of appropriate regulations and the provision of necessary facilities.

Rinderpest

Of the member countries represented at Manila those in which rinderpest persists are India, Pakistan, Cambodia, and Vietnam. In Thailand the disease appears to be under control after extensive outbreaks in the previous two years. The nearest area to New Zealand where active rinderpest is uncontrolled is the extreme south-east corner of the mainland of south-east Asia (Cambodia and Vietnam).

The conference was very optimistic about the extension of control measures against rinderpest in the Far East and there is an awareness of the need to control the disease or at least limit its spread by vaccination. Nevertheless to Eastern countries the term "free from rinderpest" does not necessarily mean what it does to us. For instance, in Thailand, Hong Kong, Burma, and South Vietnam, as a result of extensive mass vaccination of cattle and buffaloes, rinderpest does not occur in these animals. Only time will tell whether this immunisation will eliminate the virus from these countries.



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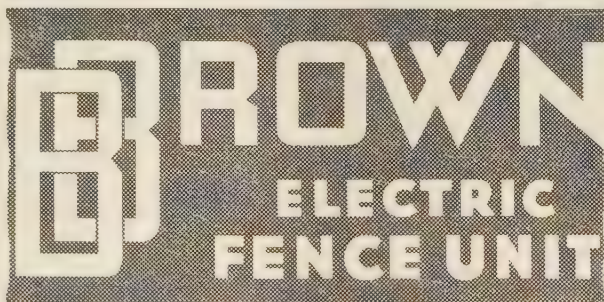
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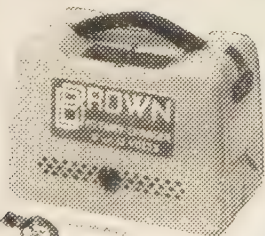
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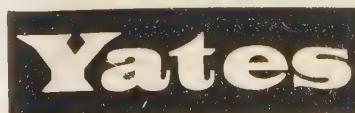


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Rinderpest and Mucosal Disease

I drew the attention of the conference to the difficulty in countries like New Zealand of differentiating between rinderpest and mucosal disease complex. It was immediately evident that the outbreak of mucosal disease complex last year in the Wairarapa, Hawke's Bay, and Otago had been well known to Far Eastern countries. I was left with a clear impression that had the Department not stamped out the severe form of mucosal disease which occurred in the Wairarapa it would have been difficult to convince some of the Governments represented at Manila that we had not had cases of rinderpest. Speaking immediately after me, the delegate from India said that authorities there had been seriously disturbed about apparent breakdowns in rinderpest vaccination until they realised that these conditions were due to mucosal disease.

Since the agenda did not include mucosal disease, no recommendations were made, but FAO and other delegates agreed in private discussions I had with them that the problems raised by mucosal disease merited intensive investigation and because of its world-wide distribution it should be discussed in the near future.

Recommendations

The meeting recommended:

1. Increased vigour in rinderpest eradication.
2. Fulllest possible support by the Governments concerned.
3. Full cooperation among neighbouring countries in the control of rinderpest (and other contagious diseases).

Dr Jamieson formed the impression that rabies is widespread in the Far East. The vampire bat (shown below) is known to transmit the rabies virus to cattle and other susceptible animals, though usually human cases arise from bites of affected dogs. The vampire bat does not exist in New Zealand, but is well known in South America.

ACTION TO MEET SPREAD OF DISEASE



A calf in the last stages of rinderpest. Discharges from the eyes and nostrils are typical symptoms of this disease. Cambodia and Vietnam are the areas nearest to New Zealand where active rinderpest is uncontrolled.

[FAO]

4. That, in view of the possible maintenance of infection in game, countries from which the disease has been eradicated in domestic stock should maintain control measures to prevent reinfection from this source and also from reintroduction.

5. In countries where there is mass vaccination of cattle and buffaloes, special study of goats and sheep should be made to ensure that these animals do not act as a reservoir of infection.

Rabies

Conference country areas in which rabies occurs are Burma, Ceylon, Laos, India, Iran, Iraq, Japan (1956), Philippines, Pakistan, and Hong Kong. Dogs, cats, pet monkeys, horses, and cattle



[FAO]

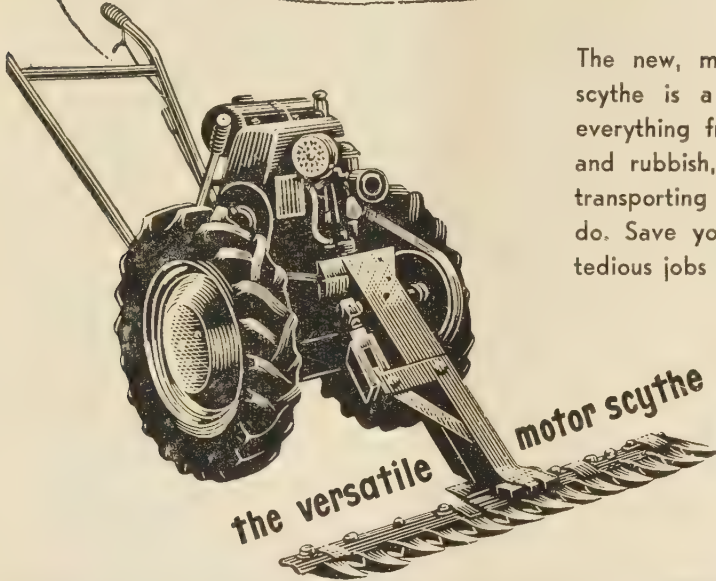
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are affected, though most human cases arise from dog bites.

My general conclusions from the discussion on rabies are that the disease is widespread in the Far East; that vaccines are used mainly as a palliative; and that until effective controlling legislation is implemented in various countries the position is likely to get worse.

Recommendations

The meeting recognised that quarantine requirements should be more stringent in countries free from rabies than in those where the disease occurs and advocated that countries in the region adopt the following recommendations:

1. That there should be a minimum quarantine period of 180 days for animals imported from rabies areas into rabies-free or lightly affected areas.

2. That animals entering areas where rabies occurs should have a certificate showing that they have been vaccinated against rabies with an approved vaccine.

3. That in countries where the disease exists recognised control measures should be adopted in addition to education campaigns.

4. That all countries should endeavour to use recently developed techniques to expedite diagnosis.

5. That all countries should give attention to the conduct of surveys among wild life to determine possible reservoirs of infection.

Fowl Pest and Other Serious Diseases

Fowl pest or its near associate Newcastle disease or ranikhet is present in every country represented at the conference except New Zealand and Australia.

The poultry industries of Far Eastern countries are being rapidly expanded to meet the need for more protein in the human diet and greater attention is being paid to the incidence and control of diseases, the most serious of which is fowl pest, with leucosis, fowl pox, and fowl cholera next in that order. Fowl pest, fowl pox, and fowl cholera are controlled as far as possible by vaccination, but there is unanimous opinion that eradication of fowl pest, either by vaccination or slaughter, is extremely difficult.

Infectious laryngo-tracheitis occurs frequently in the mild form known in New Zealand. It was interesting to hear that though in India and Malaya avian salmonellosis is fairly prevalent, pullorum infection is not common.

Nomenclature

The conference agreed that there was urgent need to standardise the

nomenclature of avian diseases. For instance, fowl pest that is also known as "Peste aviare" is comparatively rare, but Newcastle disease is very widespread. Respiratory infections of poultry are ill-described and terms such as "infectious sinovitis" are not satisfactory for statutory certification.

Recommendations

The conference recommended:

1. That FAO-OIE should prepare a draft list of diseases and relevant names for consideration at the next meeting.

2. That OIE take appropriate action to promote greater uniformity in vaccine testing techniques.

3. That an attempt should be made to attain standard legal requirements for movements of poultry and poultry products between countries in the region and that a uniform method of certification acceptable to all countries should be prepared for consideration and possible adoption by a future meeting.

DISEASES OF YOUNG ANIMALS

Young animals in Far Eastern countries are beset with external and internal parasites. Bacterial infections such as salmonellosis and leptospirosis are rife and malnutrition and unhygienic conditions are commonplace.

The conference recommended that Far Eastern countries should initiate detailed surveys on disease incidence in young animals and that a future meeting review the results and consider ways of reducing losses. My own view, however, is that this step is premature in view of the urgent need at present to concentrate available resources on the control and, if possible, eradication of the more serious infectious diseases. The surveys envisaged would require a large increase in trained personnel and even then in some areas the terrain might make these very difficult to conduct.

NEED FOR COOPERATION

The increasing spread of certain serious livestock diseases was seen by the Australian delegate as a pincer movement on the Far East region, with infection from Africa and the Middle East as the larger claw and from the American continent as the other. The plea which this delegate made for meeting the threat expresses precisely the views held in this country. He concluded: "... all of us in this Far East region must be on the alert against these viral diseases that are on the march; we must restrict movement of animals which can carry the infections, we must take

... ACTION TO MEET SPREAD OF DISEASE

every possible precaution against the introduction of infected biting insects by aeroplanes, and we must both receive and give all the information on epizootics we can, for to be forewarned is to be forearmed".

Meetings such as that at Manila are leading to international cooperation without which control or eradication of serious livestock disease is doomed. New Zealand's participation will lead to the building up of her defences against serious infectious livestock diseases, from which at present we are so fortunately free and which could have such serious economic consequences.

American Veterinarian Joins New Zealand Department of Agriculture

AN American veterinarian who, with his wife, visited New Zealand last year was so impressed with the country that he has returned to live and work here. He is Dr W. G. Aldridge, and he is now a Veterinarian in the Department of Agriculture at Tauranga.



Dr Aldridge

Dr Aldridge is aged 40 and is married, with three children. He studied at the University of California at Davis and the Texas Agricultural and Mechanical College from which he received a Doctorate of Veterinary Medicine.

Dr Aldridge has been in private practice as a veterinarian in the United States. He has served two terms as an officer in the United States Army Veterinary Corps, from 1943 to 1946 and 1951 to 1953.

Care of Livestock during June



By the Animal Research Division

EXPERIMENTS have shown that cows fed well during winter will produce from 26 to 63 lb more butterfat in the following lactation than those which have been poorly fed during winter. These results were obtained when both groups were well fed after calving.

WINTER FEEDING OF DAIRY COWS

It is therefore very important to feed the cows well from now until calving, so that they have ample body reserves to draw on during the first two months of the lactation.

It is difficult to build up these body reserves with even liberal amounts of hay and/or silage unless some grass is also available throughout the dry period. With a portion of the farm closed for autumn-saved pasture for feeding after calving, it is particularly important to graze the rest of the farm under a controlled rotational grazing system with adequate spelling between grazings, both to ensure continued grass growth during winter and to ration what grass is available throughout this period. Where subdivision is inadequate for this purpose break grazing with the electric fence is essential. Since cows will eat grass in preference to most other feeds, they should be fed as much hay as they will clean up in addition to 20 lb of silage per cow per day.

In areas where sheep become infested with liver fluke flocks should be drenched now. The only effective drug is carbon tetrachloride, which should be mixed with four times its volume of liquid paraffin. The dose of the mixture is 5 c.c. for sheep of all ages, and 1 gallon is enough for about 900 sheep. Further information

LIVER FLUKE IN SHEEP

about liver fluke in sheep and cattle will be found in Bulletin No. 248, "Liver Fluke of Sheep and Cattle", which is available from the nearest office of the Department of Agriculture.

Worms are sometimes still troublesome in May and June, and if lambs or calves are not doing well, they should be drenched with fine-particle phenothiazine at the full dosage rates recommended by the manufacturers. Further information about worms and drenching will be found in Bulletins No.

WORMS IN LAMBS AND CALVES

171, "Internal Parasites of Sheep", and No. 189, "Control

of Internal Parasites by Phenothiazine", which are obtainable from the nearest office of the Department.

Poultry lice can cause considerable loss of condition in birds and reduced egg laying. To control these parasites a fine trickle of 40 per cent nicotine sulphate should be run along the perches on a calm night before the birds go to roost. A second treatment should be given 10 to 14 days later to kill any lice hatched out from nits or lice eggs.

LICE ON POULTRY

Rickets in lambs occurs frequently during winter in Canterbury and other South Island districts. It is also occasionally seen in the North Island. Lambs wintered on green oats or barley are most susceptible, but other green feed or good pasture may also produce the condition. It can be prevented by giving one dose of 25 m.g. of calciferol (a vitamin D concentrate) at the beginning of winter. This preparation can be bought dissolved in olive oil with full instructions for use. It is unlikely to be beneficial during autumn and the best time to administer it is about the end of May.

RICKETS IN LAMBS

Sows and store pigs should be fed on roots, grass, and up to 1 lb of meat meal or other high protein feed daily. Grazing pigs should not be confined to small paddocks during winter. The use of large grazing areas will reduce pasture damage considerably. Warm accommodation is essential for winter store pigs to avoid losses and maintain steady growth. Early farrowing sows should be put in their farrowing quarters and fed 3 to 4 lb of meal daily. After farrowing they should be fed 4 gallons of milk plus 2/3 gallon for each piglet suckled. Where insufficient milk is available meal should be used to replace milk substituting 1 lb of meal for 1 gallon of milk. Constipation, which is common in late pregnancy, can be avoided by feeding 1/2 lb of bran daily or 4 oz of molasses two or three times during the last 10 days before farrowing.

PIG PRODUCTION

Where pregnant ewes are wintered on swedes, turnips, rape, chou moellier, or kale for several weeks before lambing, goitre, sometimes accompanied by high death rates, may occur in their lambs. This can be prevented by giving the ewes extra iodine during the last two months before lambing.

GOITRE IN LAMBS

If iodised salt licks are used, these should contain 5 oz of potassium iodate to the ton. However, it is better to dose the ewes with iodine contained in a drench. For this purpose potassium iodide is a safe and convenient compound because it dissolves easily in water. Sufficient drench for 160 doses is made by dissolving 1 1/2 oz of potassium iodide in 1 gallon of water. Each ewe should receive a 1 fl. oz. dose of the resulting solution about two months before lambing and a second similar dose about one month before lambing.

Beef herds have probably been worked to a hard store condition. From now on they should be slowly improved in condition. Pastures which have "got away" under lax grazing by hoggets are ideal for this purpose. Crops and hay if available may be rationed out to the cows. On dirty faces feeding out of hay is best, as it leads to both seeding of the pasture and crushing of unwanted growth through trampling.

BEEF HERDS

Winter Pasture Management

Seasonal Notes by the Farm Advisory Division

BREAK FEEDING WINTER FORAGE

TO utilise winter forage properly and to ensure supplies through to the end of winter some form of break feeding is necessary. The number of breaks and size of a break will depend on the crop, the stock, and other feed supplies available. The technique employed should provide good utilisation and clean feed of good quality at the right time.

Young stock should receive preferential treatment by being fed on a fresh break, using older sheep to clean up the remainder of the crop under dirtier conditions. It may be necessary to accustom hoggets to winter feed and to do this they should be closed on an area for a week in the early part of winter. To have good feed for the period just before lambing it is often necessary to ration supplies strictly in the earlier part of the season.

Where grass is sown with the crop, the provision of good feed can be ensured by a system of back fencing. This does not involve a great deal of extra work since at each move only the back fence is shifted. By the time the last break is being fed the young grass in the earlier breaks will be showing considerable recovery. Even when no grass is included back fencing is worth while, as it prevents continual pugging under wet conditions. When the earlier breaks are ploughed the soil is friable and requires the minimum of cultivation.

—B. J. McSWEENEY, *Timaru*

* * *

WINTER MANAGEMENT OF DRAINED PASTURES

DRAINED pastures can be pugged as easily as undrained ones during wet weather. If they are pugged, their drainage will be impaired.

The following are suggestions to prevent pugging:

1. Allow drained paddocks to grow some inches of pasture cover before the onset of wet weather and then control grazing so that the pasture is not grazed bare. An inch or two of cover acts as a "buffer" between the animals' hooves and the soil.

On set stocked areas the maximum safe stocking rates are suggested as six or seven adult sheep or one cattle beast per acre.

2. On dairy farms the drained paddocks should be shut up in the autumn to be fed off in breaks when the pastures are 4 to 8 in. and should be back fenced. Back fencing reduces trampling over the grazed area and also assures a faster recovery of the pasture.
3. When it is necessary to use a drained paddock as a run-off when feeding off a forage crop, pugging will take place and the drainage will be affected as a result. The paddock used as a run-off should where possible be the one which will be cultivated the following season, as the cultivation will restore the original soil structure destroyed by pugging.

Winter management of drained areas is most important and should be planned before winter approaches so that as small an area of the farm as possible is bared and pugged by overgrazing.

—K. L. MAYO, *Palmerston North*

* * *

WINTER GRAZING OF LUCERNE

CONTRARY to opinions held widely in the past, farm practice today indicates that the common hay-type lucerne varieties can be grazed frequently without damage. There is considerable evidence that judicious grazing management can increase both the yield of lucerne and the productive life of the stand. Grazing, and in particular winter grazing, benefits lucerne in two ways. It aids in the control of the weeds and weed grasses that invade lucerne stands and when mixtures are used it is essential to the maintenance of a satisfactory grass-lucerne balance. Its second and most important function is to maintain the high level of fertility necessary for thrifty lucerne.

If hay reserves are adequate, or late haymaking risky, stands shut in late autumn may be break fed through early winter. This system is well suited to grass-lucerne mixtures and average crops will provide rations for 1,000 ewes per acre per day. It is often better to utilise late autumn production in this manner than to incur the cost of baling and feeding out.

Recent experience indicates that grazing may continue up to mid July in the colder districts with no adverse effect on the subsequent spring production of the lucerne. If the control of grass weeds is the objective, heavy late winter grazing appears to give the best results. Where possible, stands should be used as a run-off or feeding out paddock. Only clean lucerne hay should be fed out on the area. Care should always be taken that heavy concentrations of stock do not cause pugging, as the lucerne plants can be severely damaged or destroyed by excessive trampling. As a general principle, aim to maintain the fertility of lucerne by adequate topdressing and by feeding back on to the stand at least part of the hay produced from it.

—M. L. CAMERON, *Timaru*

* * *

OVERSOWING OF TUSSOCK GRASSLAND IN CENTRAL OTAGO

BEFORE oversowing low rainfall hill country a cover of tussocks, indigenous grasses, and herbs is necessary to aid moisture retention for establishment of better grasses and clovers. This can best be achieved by careful grazing management and spelling at certain times of the year to allow maximum reseeding, though additional fencing may be necessary to avoid overgrazing on warm country or to utilise rank growth on shady country.

Many areas have been oversown from the air with fertilisers and inoculated red, white, and alsike clovers only, because of problems associated with the establishment of grasses due to low soil fertility or dense ground cover. Cocksfoot is the most generally suitable grass to introduce into tussock country and can be included initially when oversowing or in subsequent topdressings, depending on local conditions. Late winter and early spring are the most suitable times for oversowing.

Trials have recently emphasised the importance of sulphur in plant nutrition and while both the sulphur and phosphorus fractions of superphosphate are needed on most soils, better results are usually obtained in Central Otago when a higher proportion of sulphur to phosphates than in superphosphate is applied. Other fertilisers may be required on some soils and those in doubt about seeding and manurial practices should seek information from the local officer of the Farm Advisory Division.

—W. A. LUNN, *Ranfurly*

—♦—

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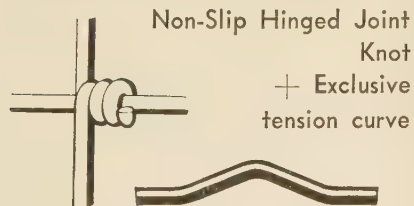
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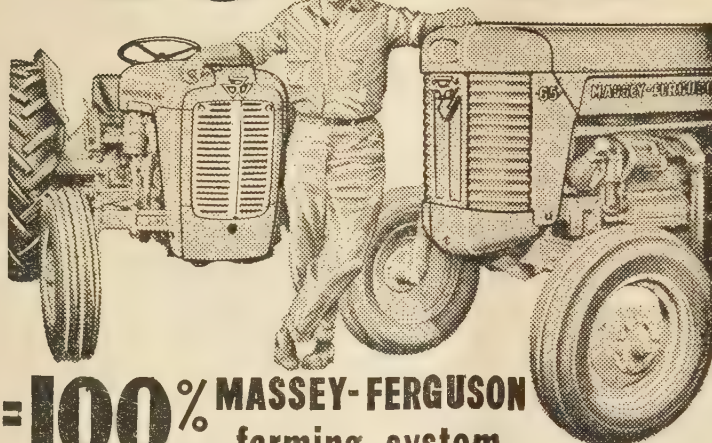
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NEW ZEALAND RAILWAYS

Turkey Breeding in New Zealand

By J. H. JONES,

Poultry Instructor, Department of Agriculture,
Oamaru

THE increasing interest being shown in turkeys, especially the demand for them at Christmas, indicates that the turkey raising industry could expand, though an effort to make turkeys popular throughout the year would be necessary. An article in the April issue of the "Journal" advised breeders on qualities required in breeding stock and methods of housing the birds. This article describes general management of breeding stock, feeding, and incubator management. A concluding article will appear in a later issue.

WHEN the method of housing the breeding stock has been decided on (for the beginner the free range system is unhesitatingly advised) the selected first-year hens (those eight to nine months old) should be settled in their breeding quarters at least a month before mating begins. As a precaution against damage by the male birds' claws when mating the hens should be fitted with canvas saddles and the claws of the gobblers, if excessively sharp, clipped.

Approximately one gobbler to 10 hens should be mated, and for flock mating a reserve team of gobblers should be kept in a separate pen to take over if fighting is excessive.

Broodies

Egg production will suffer during the hatching season if prompt attention is not given to broody hens. About half of the broodies can be recognised by the common signs of nesting at night, hissing, and walking on tiptoe, but others present a little more difficulty. Examination of the vent will show this to be dry in the non-layer and moist and larger in the layer.

The safest plan is to remove all birds which are found in the nest at night and coop them on a slatted or wire floor. If well fed and watered in sight of the rest of the flock, they can be returned in three to six days.



Incubator setting capacity for turkey eggs is about two-thirds that rated for hen eggs. Some aspects of incubation of turkey eggs require more attention than the hatching of hen eggs and details are given in the accompanying article.



[Robertson

A canvas saddle pad being fixed in position on a breeding female turkey to protect the bird from the male bird's claws.



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Artificial Lighting

As Christmas in New Zealand is in midsummer, producers do not have to hatch poults early to have them ready for Christmas, but in northern hemisphere countries night lighting is used extensively with breeding stock to encourage early egg production.

Lighting stimulates the glands controlling the reproductive system, and as the male organs respond more slowly than the female, the gobblers are given lights three to four weeks before the hens. Lighting will not increase the rate of production, but it will give an earlier and longer hatching season.

The system commonly used overseas is to give a 14-hour day, with lights early in the morning. A 40-watt bulb to 100 sq. ft. of floor space is adequate and lights are arranged to illuminate the food and water troughs and all perches. It is important in areas away from the coast that precautions be taken to prevent the water from freezing.

Egg production generally starts three weeks after lighting and in three weeks production is at 50 per cent.

To avoid disease the turkey breeding flock should at all times be segregated from any other poultry and the young turkey growing stock. In intensive conditions or where disease is known or suspected to be present some breeders regularly dose the breeding stock to keep worms, coccidiosis, and blackhead under control. All breeding stock should be tested for pullorum disease before being put into the breeding pen.

Feeding Breeding Birds

In feeding breeding stock the object is to maintain the stock in good condition and health and to produce sound hatching eggs capable of producing healthy poults.

When the turkeys reach the breeding pen they should be in prime condition with plenty of vigour, for they will normally lose weight during the breeding season. There is little fear of overfeeding the turkey hen before she starts to lay. It will be noticed that food consumption often decreases as the hens near production.

The breeders' diet must provide all the needs of the parents to enable them to cater for the balanced growth and development of the embryo during the 28 days of incubation and initial stages of life. The diet must be complete, properly balanced, and contain a variety of high-quality protein in addition to being well fortified with vitamins, particularly A, D, E, and riboflavin, and have adequate minerals, especially calcium, phosphorus, and manganese.

Only the best food, in fresh condition to avoid loss of vitamins, should be fed.

Breeders on free range on good pasture, or where receiving good-quality green feed, can often overcome some of the deficiencies in the rations, but intensively housed breeding stock must be given a complete diet which contains all the essential requirements.

In practice the requirements of the breeding stock are supplied by feeding a good-quality breeders' mash or pellets with wheat or mixed grain, with free access to water and limestone or shell and metal grits, and a daily supply of fresh green food. Birds kept intensively and not fed fresh greens should receive dried dehydrated lucerne meal incorporated in the mash.

The protein intake should be maintained at 15 to 16 per cent of the total food.

The value of milk powder, yeast, whey products, green food, and cod liver oil as sources rich in essential vitamins in the breeders' diet has been well demonstrated as an aid to high hatchability.

Care must be taken that too much green feed is not consumed to the detriment of other essential nutrients.

System of Feeding

The system of feeding turkey breeders most favoured in New Zealand is to supply mash ad lib in troughs or hoppers, with a controlled feed of grain on the ground once a day. A better method is grain in hoppers opened for two hours in the afternoon. To ensure an adequate protein intake the grain must be regulated according to the protein content of the mash, but generally it should not exceed 40 to 50 per cent of the daily food consumption.

The daily food intake of the breeding flock can vary according to the size and breed of the birds and the weather, the intake rising as the weather becomes colder. It is safer to offer more food than can be consumed than to underfeed.

As a general guide consumption of food for the American Mammoth Bronze or Broad Breasted Bronze can be assessed at 7 to 10 oz per breeder per day, or 13½ to 19 lb of feed per month. The following breeders' mashes to be fed with a scratch grain of wheat, wheat and barley, or wheat, barley, and heavy oats will be found satisfactory.

... TURKEY BREEDING IN NEW ZEALAND

Mash		Lb	Lb
Wheat meal	..	400	420
Barley meal	..	—	400
Maize meal	..	200	200
Pollard	..	400	340 (pollard or bran)
Bran	..	280	
Lucerne meal	..	160	120
Milk powder	..	160	160
Salt (manganised)	20	20	
Lime	..	20	40
		2,000	2,000

To these mashes should be added vitamins A and D, either synthetic or cod liver oil to the manufacturer's recommendations, and 8 oz of manganese sulphate. This small quantity of manganese can be incorporated in the mash most easily by first mixing it with the salt.

Incubation

Incubation of turkey eggs is only now being brought to the same level as that for hen eggs. Attempts to use cabinet incubators without the necessary modifications, such as turkey trays to hold the larger eggs, have had varying success in this country.

Period of Incubation

Turkey eggs require 28 days to incubate and all poults should be hatched within 40 hours at the most after the first poult appears. The peak periods of embryo mortality occur at the fourth, twenty-fifth, and twenty-eighth days.

Collection of Eggs

Hatching eggs must be collected frequently, at least two or three times a day, and in extremely hot or cold weather every two or three hours. Broody turkeys should be dealt with and not allowed to sit on the eggs; otherwise the development of the germs will be affected. The eggs are best stored large end up on spare incubator trays, and if to be kept more than seven days, should be turned every day by tilting the trays at an angle of 45 degrees.

The egg storage room temperature should be maintained at as near 55 degrees F as possible at all times and the humidity at 55 per cent. Dirty eggs can be prevented by clean nesting material and frequent collection. Any eggs excessively dirty should be only lightly scraped.

To improve hatchability select only good eggs, as this can also prevent the production of poor types of poults. Eggs can also be candled before setting to check for internal faults and hair cracks. Eggs with chalky or rough shells, poor in shape, and of undesir-

TURKEY BREEDING IN NEW ZEALAND . . .

able size should not be set. Eggs of 2½ to 3 oz appear to give best hatchability, and those of less than 2½ oz or more than 3½ oz poor results. The fresher the eggs are the better the hatching results will be. Eggs over a week old show a marked falling off in hatchability.

Setting capacity is about two-thirds that of the rated capacity of the incubator for hen eggs.

Incubator Room Temperatures

The ideal temperature for an incubator room is 60 to 70 degrees F with frequent changes of air (up to eight to 10 per hour). As the hatching of turkeys often lasts until the hotter months of early summer, ventilation will often be the chief difficulty.

Incubator Management

The four principal factors that affect the number of poults hatched from the fertile eggs set are: temperature, humidity, ventilation, and turning. Each of these factors influences the growth of the embryo during incubation. The first three factors are interrelated and any alteration of one factor will affect the efficiency of the others.

Incubator manufacturers provide comprehensive instructions for the operation of their machines, but local conditions sometimes necessitate a slight variation in procedure. A record of the conditions of each hatch is therefore of interest and importance for determining the environment which provides the best hatching results.

Proper Temperature

The necessity for an accurate test of the thermometer and temperature control mechanism cannot be over emphasised, for this is possibly the most important of the principal factors. The limits of temperature variation that can be tolerated are very narrow.

Steady temperature during incubation is essential for correct hatching time. It is of the utmost importance that the temperature does not rise above the optimum, as this can cause high embryo mortality and hatching abnormalities such as crooked toes, spraddle legs, and small poults. Low temperatures cause abnormal embryos in the early stages, losses through failure to hatch, and delayed hatching.

The most frequently used temperatures with cabinet machines are:

Combined setting and hatching machines, 99.5 degrees F.

Setting compartment, 99.5 degrees F.

Hatching compartment, 99 to 99.5 degrees F, or 97 to 98.5 degrees F.

Humidity

The ratio of moisture in the air to the amount the air is capable of holding at a given temperature is known as the relative humidity. It is expressed as per cent relative humidity and is assessed from readings of wet and dry bulb thermometers.

Eggs normally lose weight during incubation through the evaporation of moisture and this is controlled by the surrounding conditions. Turkey eggs require more moisture than hen eggs, especially during the last four days of incubation. The poult is about 66 per cent of the initial egg weight.

The approximate loss of moisture can be ascertained by the size of the air space. If conditions in the incubator are dry, the rate of evaporation from the egg is increased and, conversely, if conditions are too moist, the evaporation is slowed down.

The latitude with relative humidity is much wider than with temperature and may possibly be as much as 5 to 10 per cent above or below the optimum without undue adverse effect.

In cabinet incubators the optimum relative humidity appears to be:

Relative humidity per cent	Dry bulb ther- mometer Degrees F	Wet bulb ther- mometer Degrees F
60 for first 24 days ..	99.5	87
70 for last 4 days ..	99.5	90
When temperature is reduced at hatching:		
70 for last 4 days ..	98	89
73 for last 4 days ..	98	90

Adequate Ventilation

Developing embryos need oxygen and give off carbon dioxide. Ventilation requirements increase as the embryos develop, and are at their maximum toward the end of the hatch with the increased output of CO₂. In most instances adequate ventilation is provided when the manufacturer's directions are followed carefully. The ventilation of the incubator room is just as important as that of the incubator itself.

Turning the Eggs

Turn the eggs at least five times daily up to the twenty-second day to prevent the embryo adhering to the shell. The period of turning should be as even as possible, ranging from first thing in the morning to as late as practical at night. Some modern turkey

incubators are now fitted with an automatic turning device which can be set to operate at hourly intervals if necessary. Turning the eggs is unnecessary after the twenty-second to twenty-fourth day.

Testing the Eggs

Eggs can be tested and infertile ones removed on the tenth day, but it is normal hatchery practice to test the eggs from the twenty-second to twenty-fourth day, when they are being transferred from the setting section of the incubator to the hatching section.

Hatching

The chief requirements for the hatching period are increased moisture and in some machines possibly a slight drop in temperatures during the last three days, with increased ventilation as the poults start hatching. The poults should dry out slowly and the moisture be reduced for the last few hours before the removal of the hatch.

It is advisable to keep the incubator closed until the hatch is complete, remembering that large and old eggs take longer to hatch than small or fresh ones. The crowded trays also tend to reduce the incidence of "sprawling", to which newly hatched turkeys are prone.

It is not a good idea to help late or weak poults out of the shell, as this could possibly lead to a reproduction of this weakness.

Disease Precautions

To avoid the transmission of disease hen and turkey eggs should not be set in the same incubator. All turkey breeding stock should be tested for pullorum disease, though this disease is not prevalent among turkeys in New Zealand. As a further precaution incubators should be fumigated between hatches with 40 per cent formalin and potassium permanganate; 1½ oz of formalin to ½ oz of potassium permanganate crystals should be used for each 100 cub. ft. of air space in the incubator.

This is done after all debris has been cleared out and all hatching and incubation equipment thoroughly cleaned.

Recording Hatching Results

It can be of much interest as well as importance to keep a record of the results of each hatch, such as the number of infertile eggs, dead germs, and eggs that fail to hatch. After the finish of the hatching season a detailed account of the running of the machine and any unusual occurrences can be of much help in avoiding pitfalls and aiding planning of next year's programme.

Value of Skim Milk as a Feed for Pigs

SKIM milk is a very valuable food for pigs, 1 gallon being assessed as the equivalent of 1 lb of barley meal, which is used overseas as the standard food unit in valuing pig foods. As a result in New Zealand, where skim milk is used as a basic food for pigs, 1 gallon is used as the standard food unit. In this article by I. H. OWTRAM, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, the value of skim milk as a feed for pigs is dealt with, and in a later article the use of supplementary feed with skim milk will be discussed.

SKIM milk has certain drawbacks when used as a basic food: first it is not of itself a complete food, though it can be used alone, if carefully fed, in the final stages of finishing baconer pigs; secondly it is a bulky and liquid food and pigs cannot thrive on such a diet; and thirdly the seasonal supply of skim milk, which rises to a peak in November and December and falls to practically nothing in winter, when the dairy herd has dried off.

The first two points are met by intelligent use of supplementary feed and the third by careful planning of farrowing dates of breeding sows and the production policy that is followed, together with the use of a small amount of supplementary food.

Fitting Pigs to the Feed Supply

The seasonal supply of skim milk for pig feeding on a dairy farm has always

been a difficult problem. In the early days of pig production the practice was to winter store pigs to be on hand to consume the skim milk that became available at the beginning of the dairying season.

These pigs had generally been farrowed in February or March and were fed on little more than a maintenance ration of purchased meal or home-grown crop during winter. As this feed was expensive the pigs were fed the least possible amount of food and losses were common. The survivors, as a result, produced a poor and overfat carcass when they reached the killing point.

Sows farrowed in spring and autumn and there were generally insufficient pigs to cope with the peak of the feed supply in November and December; in consequence overfeeding of skim milk took place and more overfat pigs of poor carcass quality resulted.

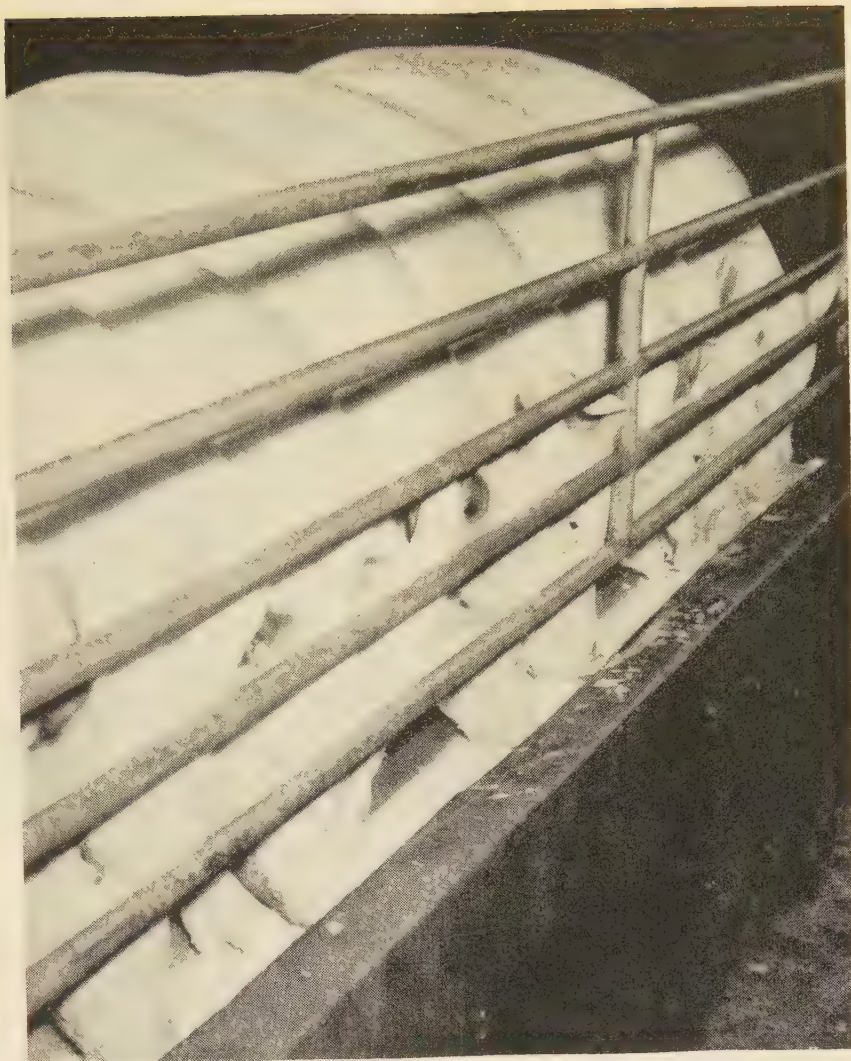
Considerable research was done on this problem and it was found that by carefully organising the farrowing dates of breeding sows it was possible to avoid having to winter store pigs and to have the maximum number of pigs on hand when the supply of skim milk was at its peak.

Avoiding any check or store period in the pig's life leads to improved carcass quality and enables full advantage to be taken of the pig's remarkable power of growth.

Farrowing sows at the correct time also means that the least possible amount of money is spent on either purchased or home-grown food, and as a result a higher net return is obtained for the skim milk.

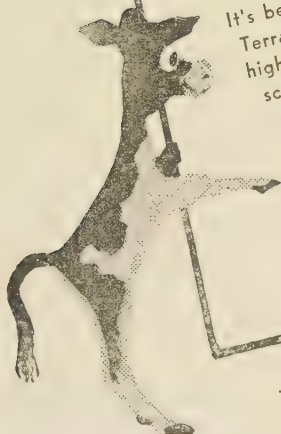
Farrowing Dates

Sows should start to farrow two and a half months before the date on which half the dairy herd will have calved,



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VALUE OF SKIM MILK AS FEED FOR PIGS



Sows should start to farrow two and a half months before half the dairy herd will have calved, and farrowing should be spread over four to six weeks.

and farrowing should be spread over four to six weeks.

If the dairy herd calves from the beginning of July onward, sows should begin to farrow at the end of April or the beginning of May. They will then farrow their next litters from the end of October. To take full advantage of farrowing sows at these times it is necessary that both baconers and porkers should be produced. The progress of these litters from farrowing to slaughter is as follows:

Litters farrowed during May are being suckled by the sow during the two winter months when the dairy herd is not being milked.

A sow and litter require less food than the same number of store pigs and are much easier to care for.

If good farrowing accommodation is used, losses will be small.

Far less labour is involved in cleaning out than

with bigger pigs, and a self-feeder for meal in the creep area reduces the time spent in feeding to a minimum.

The earliest of the litters will be reaching the weaning stage when the dairy herd begins to calve, but, of course, will not require very large quantities of skim milk.

However, as calves being reared for replacements will have been saved

from the early calvers, there will not be a very great quantity of skim milk available for the pigs and they will be quite capable of dealing with it.

As the litters grow during spring the supply of skim milk grows with them, so that they can be taken up to bacon weight without any shortage of feed.

There are likely to be a few pigs in these litters, however, that will be of

the early maturing type, and that, taken to bacon weight, will be overfat. These should be disposed of at pork weights.

Most of them, provided the right breeding stock is used, can be taken to bacon weight, which they will reach at six and a half to seven months old, that is, from mid November to the beginning of January.

After weaning in July the sows will have been mated again and will far-

Development of Pig Industry

THE introduction of cream separators on farms in the early years of this century solved the problem of cartage of whole milk to the dairy factory, but left the farmer with the problem of how to dispose of the skim milk, and the only answer in those days was to feed it to pigs. And fed it was, with no particular thought given to either the quality or quantity of pig meat produced. Skim milk was used as the only food for the pigs, apart from a little meal, generally pollard, that was fed in winter when the cows were dry.

From these primitive beginnings the pig industry has progressed and today more and more dairy farmers are realising that the production of pig meat from skim milk is a very profitable sideline and that pigs, when properly kept and fed, are easy and pleasant animals to manage.

Dairy farmers who keep pigs comprise two broad groups. By far the larger group produce pig meat to obtain the greatest net return from the skim milk with the lowest possible expenditure on purchased or home-grown supplementary food. The other and much smaller group consists of farmers who are pig enthusiasts and who milk cows only to enable them to keep pigs. In this group are the pedigree breeders to whom the industry looks for constantly improved breeding stock that will produce a better-quality carcass more economically.



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Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during January
1960 and for the six months ended 31 January 1960 with comparative figures for the same
month and for the six months of 1959 have been compiled by the Dairy Division of the
Department of Agriculture from figures supplied by divisional officers at the various grading ports:

Period	BUTTER				Percentage inc. or dec.
	Creamery (tons)	Whey (tons)	Total (tons)		
January 1960	18,606	340	18,946	—	
January 1959	21,472	347	21,819	—	
Decrease	—2,866	—7	—2,873	—13.167	
6 months ended 31/1/60	118,967	2,064	121,031	—	
6 months ended 31/1/59	129,288	1,827	131,115	—	
Increase or decrease	—10,321	+237	—10,084	—7.691	

Butter in store at 31 January 1960 was 21,775 tons

CHEESE					
Period		White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
January 1960	..	9,226	1,117	10,343	—
January 1959	..	7,750	1,891	9,641	—
Increase or decrease	..	+1,476	—774	+702	+7.281
6 months ended 31/1/60	..	52,876	7,270	60,146	—
6 months ended 31/1/59	..	41,799	10,161	51,960	—
Increase or decrease	..	+11,077	—2,891	+8,186	+15.754

Cheese in store at 31 January 1960 was 15,784 tons

If these figures are converted into butterfat equivalent, there is a decrease of 4.139 per cent
in butterfat graded for the six months as compared with the preceding season. The above figures
refer only to butter and cheese graded for export, and owing to diversions which may take place
they are not necessarily a true indication of production trends.



row from the end of October onward. This means that when the production of the dairy herd is at its peak and the greatest quantity of skim milk is available the pig population on the farm will also be at its maximum. The majority of the previous litters will be approaching finished bacon weight and all the breeding sows will be suckling litters.

Dairy production will remain at a high level during December and January unless the season is abnormally dry. During this period there may be a larger supply of skim milk than the pigs can cope with, unless they are overfed, which must be avoided at all costs, as it will result in overfat pigs of poor carcass quality. If this situation arises, the best course is to preserve as curd skim milk that is surplus. It will be extremely useful for feeding to sows and litters in winter. Full details of the method used in curd preservation are given in an article on supplementary feeding of pigs, which will appear in a later issue of the "Journal".

From the end of January dairy production will decline steadily until the end of the season and, as a result, the pigs farrowed in November will be faced with a decreasing food supply as they grow. To deal with this situation the pigs should be disposed of as porkers during late summer and autumn as soon as any of them have reached porker weight, that is over 60 lb carcass weight or 90 lb live weight, and are properly finished.

Throughout February, March, and April pigs should be disposed of as porkers at every opportunity, so reducing the number of pigs on hand as the supply of skim milk falls. In seasons when there is a good autumn for dairy production it will be possible to take a number of pigs up to light bacon weight on skim milk.

In normal or dry seasons it will probably be necessary to use supplementary food, home grown or purchased, but preferably home grown, to finish off the last of the pigs as either porkers or light baconers, the object being to have on hand at the end of April only the breeding stock and be ready for the sows to farrow in May-June.

Where a farmer has suitable accommodation and is able to use artificial heat for young litters, a considerable advantage can be obtained by early weaning litters farrowed in May-June. This means weaning the litters between 21 and 28 days of age. The result is that the sow can be mated again a month after farrowing and will, in consequence, farrow her next litter a month earlier than if weaning were at the normal age of eight weeks.

The second litters, which will be farrowed from the end of September onward, are very much easier to get away as either baconers or porkers, as



Litters farrowed during May can be taken up to bacon weight without any shortage of feed occurring. As they grow the supply of skim milk grows with them.



Litters farrowed during November should be put off as porkers during autumn, when the supply of skim milk is decreasing.

they will be much further advanced by the time the supply of skim milk starts to decline in autumn.

Weaning earlier than about 18 days of age is not recommended until the method of early weaning has been completely mastered by the farmer, as it has been found in practice that pigs that are weaned at about three weeks of age are easier to manage than pigs that are weaned earlier.

If the farrowing dates of the sows are organised on these lines, and a policy of selling baconers from the May-June litters and porkers from the November-December litters is followed, the maximum return in pig meat from the skim milk available will be obtained, with the minimum expenditure on purchased or home-grown supplementary feed.

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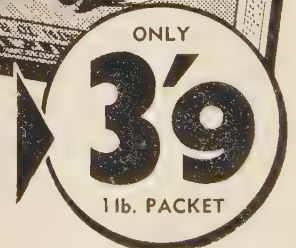
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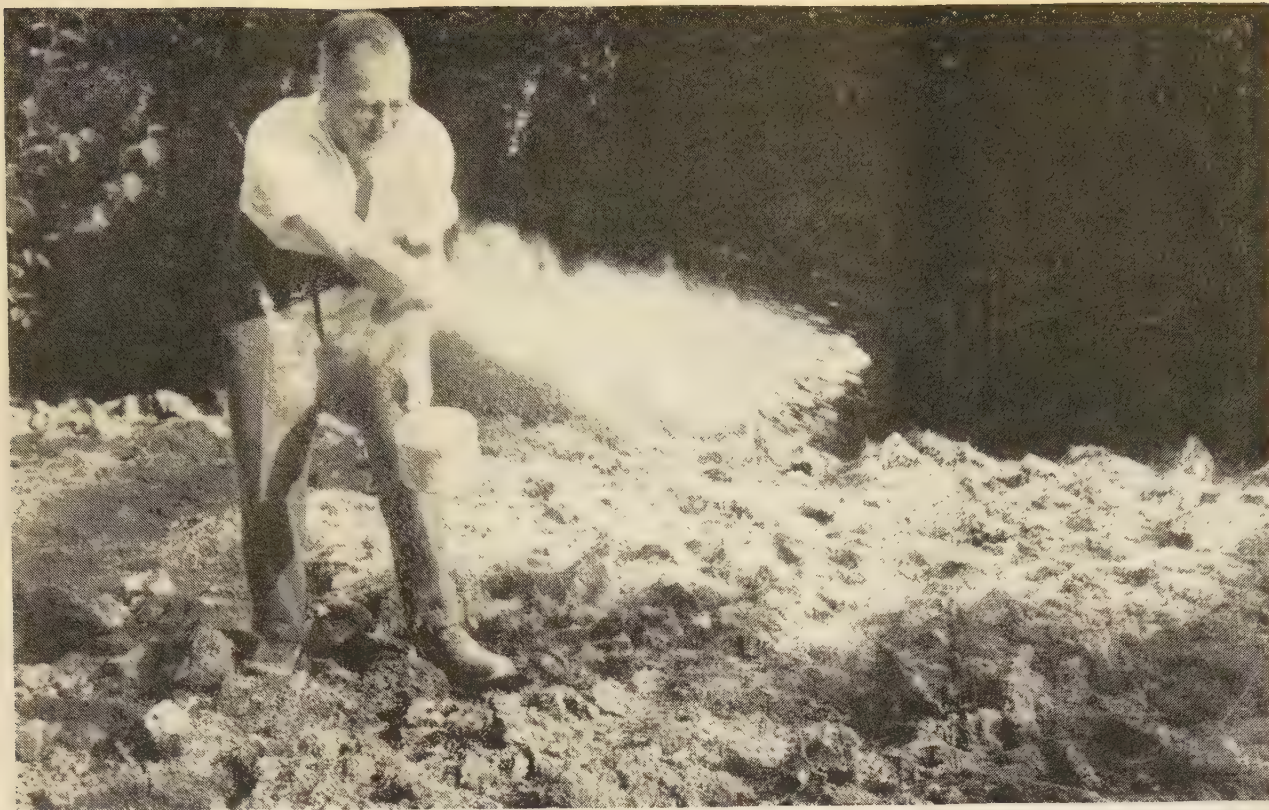
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[Sparrow

The Home Garden in June

By A. G. KENNELLY,

Horticultural Instructor, Department of Agriculture, Dunedin

CONDITIONS are often pleasant for home garden work in June, but because soil temperatures are rather low, maintenance and construction work should generally be given priority over planting and sowing. Sowing in particular is better deferred until after the shortest day.

THE well planned home garden should show to advantage in June and though the kinds of vegetables available may vary from district to district, root crops should be available in variety as should some of the winter greens, such as winter cauliflower, savoy or winter cabbage, curly kale, and brussels sprouts. There should also be celery, silver beet, spinach, winter rhubarb, leeks, and lettuce, and, in store, potatoes, onions, pumpkins, squash, and sometimes kumaras and Jerusalem artichokes.

Spring cabbage can still be set out in most gardens; cauliflower also may be planted in sheltered situations or in districts where winters are not too

severe. Soils should be well drained and adequately enriched, preferably with organic material such as compost and farmyard or stable manure.

Celery and leeks should receive their final earthing up if this work has not yet been done, and the digging of potatoes should be completed without delay. Broccoli or winter cauliflowers should be watched for signs of approaching maturity and the developing curds protected by bending or breaking of a leaf or two over each head.

Land from which crops have been recently harvested and which is to be used within the next month or so

Sowing and Planting

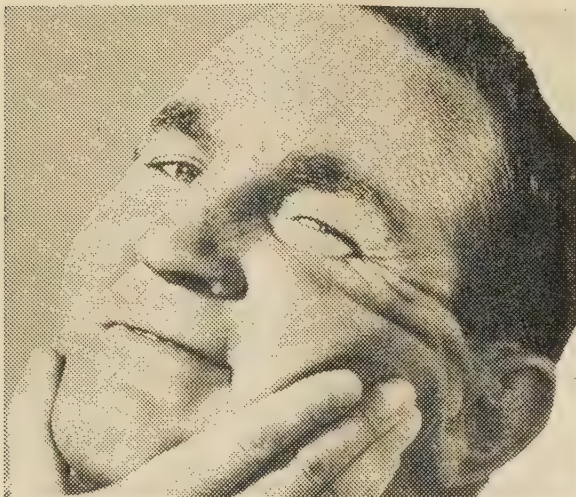
Sow as Required

Broad beans	}	In well drained soil in favourable situations
Spinach		
Cabbage		
Cauliflower		
Lettuce (for late spring use)		

Plant

Cabbage	}	In well drained soil
Cauliflower		
Lettuce		
Shallots		
Rhubarb		
Asparagus		
Horse radish		
Potatoes (in early districts)		

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should be dug over to improve drainage and to assist the rotting of root fibres and similar residues and to expose insect pests and their eggs to birds and other controlling agencies. Green crops that are in the flowering stage or approaching it or which are growing on land soon to be used for a vegetable crop should be turned in to rot down. If digging is left too long, the weather may make it more difficult.

Liming may be advisable, and June and July are generally suitable months for applying lime, as in many gardens a considerable area is then bare of crops and winter and spring rains can usually be relied on to wash the lime down through the soil.

Asparagus fern growth should be cut down if this has not been done, and the bed can be mulched with compost or a light dressing of farmyard manure. The compost heap can be turned or remade if required.

Planning for the forthcoming season should be given consideration in June, as soil conditions are not always conducive to garden work. But in general there is always some work to be done in the garden and though in most districts there is less sunlight and it is colder and damper in June than in any other month, the keen gardener can usually find work to do.

In wet weather garden tools should be sharpened and oiled or polished and where necessary repaired. It may be thought by the less interested gardener that polishing garden tools is carrying enthusiasm for doing the job too far, but this is not so. A short time spent in removing rust and other residue that commonly adhere to garden tools and giving the working parts a smooth finish will be more than compensated for by the time and energy saved when they are used.

Soil or rust adhering to garden tools may make work more than twice as hard and often leads to inefficient garden practice. Soil adheres less readily to smooth, polished surfaces and when it does it is more easily removed. All cutting edges should be very sharp unless the tools are to be used by children or those who cannot handle them competently; cutting edges of tools such as hoes, spades, and shovels are then better not filed down to the extent where they may be dangerous.

Compost

In home gardens the utilisation of all organic waste from the kitchen and garden by returning it to the soil can hardly be over-emphasised, and the properly constructed compost heap offers an efficient method by which waste material can be converted to vitally needed humus. Maintaining a good tilth is difficult in most soils that have been intensively cultivated for a number of years without the return of adequate supplies of organic material



Garden and household residues should, as far as practicable, be returned to the soil. A good compost heap provides a tidy, efficient way of rotting suitable organic matter.

that can be converted to humus. The soils tend to break down and lack body, and maintenance of favourable conditions of moisture and aeration is difficult.

June is a good month in most gardens to start a compost heap, because a good deal of crop residue usually becomes available then and it is not always convenient to dig it into the ground immediately. Crop residues should not be burnt unless they are too woody to rot readily or are diseased.

The compost heap should be reasonably handy for the housewife and easily accessible with a wheelbarrow. Proximity to water, too, is a consideration with large heaps which dry out quickly. Compost heaps need not be of any special shape, and the size will be determined mainly by the amount of material available.

Aeration

The important points to consider are aeration, retention of moisture, and drainage. Aeration from the base should be provided by a drainpipe or a quantity of open material, such as

woody hedge clippings, or both. Properly constructed bins usually have a grid at the bottom to which air is supplied by a pipe.

Adequate ventilation to induce a good draught through the mass is essential in the first stages of composting, but in the maturing heap it is not required and may even be wasteful of organic matter such as nitrogen and ammonia. Pipes should be blocked or removed in the later, maturing stages of the heap.

Methods of composting vary widely in detail, but the principles are similar in all. Layers of the materials to be composted are alternated with thinner layers of farmyard manure or a heavy sprinkling of artificial manure rich in nitrogen. Lime is usually added to reduce acidity and so enable the bacterial activity to increase. Heaps are usually about 3 ft 6 in. to 4 ft wide and rarely higher than 4 ft. In heaps smaller than about 4 ft wide by about 4 ft long the ratio of exposed surface is disproportionately large compared with the volume, and the breaking down of the material is slower. A bin is desirable for small heaps.

The rate of decay depends largely on the nitrogen content of the materials and the supply of moisture and air. For retaining walls wood is best, but wire netting will do. Stone, concrete, iron, or brick is usually considered less satisfactory unless side aeration is provided. No floor other than the earth is needed, though an air supply from the bottom is essential.

A special wooden container, or preferably a series of them built so that the compost can be turned successively as breaking down occurs, is excellent. A box about 12 ft long, 4 ft wide, and 4 ft high divided into three compartments by movable partitions and a movable end to facilitate turning and removal of the compost is suitable.

Sowing Early Crops

Except in favourably situated gardens where soil conditions are good, sowing of peas, radishes, turnips, spring onions, spinach, silver beet, and lettuces should be deferred until at least the beginning of July unless cloches or frames are available. Seed of lettuce for spring use can be sown in a box, but the other vegetables except peas should be covered with cloches or sown directly into the frame, the soil of which should be light and well drained, with well rotted organic material such as compost thoroughly incorporated in it.

Heavy soils can be lightened by the addition of sand or organic matter.

Sand has no direct manurial value, but by improving drainage and preventing the soil from caking it increases aeration and so enables the soil to warm more quickly and young roots to penetrate more readily. The culture of broad beans, lettuces, potatoes, and spinach was discussed in last month's "Journal".

Cabbages and Cauliflowers

Seed of cabbages and cauliflowers for successional planting can be sown now. Among the round, smooth-leaved type of cabbages Golden Acre is excellent. In good conditions it is quick maturing and tender and in addition does not grow too large. Varieties of cauliflower such as Early London, Walcheren, and All Seasons are suitable for sowing now in most districts for planting out in early spring.

Except in a few specially favoured districts, seed should be sown in a sheltered, prepared bed with a favourable aspect or under cloches or in a frame or cool, open glasshouse. Sowing in boxes is not recommended, but if boxes are used, they should be deep enough to provide ample root room. Thinning may be advisable later.

The seedbed for cabbages and cauliflowers should be deeply and thoroughly cultivated and the soil enriched with compost or well rotted material. Lime should be applied to most soils not recently dressed; 2 oz to 4 oz per square yard annually is usually satisfactory. Seed can be sown broadcast in beds, but for convenience

of weeding and for ease of lifting is usually best sown in rows about 12 in apart. Seed should be sown not more than $\frac{1}{4}$ in. deep.

Cabbage plants of the pointed type for spring use can still be set out in most districts. In districts having a mild, rather warm winter, however, smooth-leaved round cabbage is often preferred, as it is considered that the harder, pointed types of cabbage tend to grow too rankly under such conditions. Cauliflower can also be set out where the situation is not too exposed and winters are not too severe. Hardy varieties such as Walcheren and All Seasons should be chosen in the colder districts.



"Handbook of New Zealand Agriculture": J. W. Hadfield

REFERENCE books on New Zealand agriculture are few. It is frequently necessary to search a number of references to find information on some particular point relating to agriculture, and for this reason Mr Hadfield's handbook will be very welcome.

As stated in the introduction it is primarily a book of reference, the subjects being in alphabetical order and numbered to facilitate the search for cross references. Further the index has been arranged under five major headings—pasture and pasture seeds, arable farm crops, soils and manures, pests and diseases, and miscellaneous—and this makes for ease in using the handbook.

The 250 subject headings are adequately covered, but one minor criticism is that under some headings there appears to be some irrelevant information. For instance, under the headings potato and wheat some of the economic information could have been omitted without detracting from the value of the book.

However, it is a credit to the industry of the author, now retired and formerly Director of the Crop Research Division of the Department of Scientific and Industrial Research, Lincoln. It could well be a "must" on the bookshelves of farmers, members of Young Farmers' Clubs, and those in Government Departments and stock firms who have contact with farmers. Students of agriculture will also find it of considerable value.

It is to be hoped that in future editions the publishers will provide the book with a more worthy cover.

—R.H.S.

Whitcombe and Tombs Ltd. 12s. 6d.

Meteorological Records for March

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches						Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall			
				Maximum	Minimum				Amount	Date		
Kerikeri	240	63.7	— 0.1	77.6	41.6	3.67	15	— 0.51	1.06	6	130	
Auckland	160	64.0	— 0.9	76.1	46.1	3.45	18	+ 0.30	2.07	21	168	
Tauranga	12	61.6	— 1.0	73.0	40.5	6.79	17	+ 2.69	1.78	17	165	
Ruakura	131	60.4	— 0.8	75.8	33.2	4.08	16	+ 1.10	1.61	21	164	
Whakarewarewa ..	1,006	58.4	— 1.3	72.3	34.1	4.79	16	+ 0.74	0.86	18	138	
Gisborne	14	59.8	— 2.2	78.2	37.4	2.66	15	— 1.04	0.49	21	155	
New Plymouth .. .	160	61.5	+ 0.5	74.2	43.4	5.80	12	+ 2.06	1.33	11	166	
Karioti	2,125	53.5	— 1.6	73.2	29.1	3.77	14	+ 1.43	0.87	14	—	
Napier	5	60.8	— 1.6	80.6	38.8	4.01	11	+ 1.33	1.35	14	160	
Wanganui	72	60.2	— 1.4	80.2	38.8	3.67	15	+ 1.52	1.19	11	168	
Palmerston North ..	110	60.1	— 0.2	80.0	33.2	3.29	13	+ 1.06	0.63	21	159	
Waingawa	340	58.2	— 0.8	79.3	34.0	2.35	15	+ 0.15	0.48	29	132	
Wellington	415	58.2	— 1.2	77.9	43.2	4.25	15	+ 1.07	1.62	11	179	
Nelson airfield .. .	5	58.6	+ 0.2	71.8	37.0	4.72	13	+ 2.03	1.61	9	184	
Blenheim	12	58.4	+ 1.5	80.1	33.5	2.17	14	+ 0.64	0.68	28	147	
Hokitika	15	57.0	+ 0.7	71.3	33.6	10.90	15	+ 1.96	2.54	23	167	
Hanmer	1,270	54.2	— 2.0	83.0	28.5	3.77	16	+ 0.41	0.83	15	122	
Christchurch .. .	22	57.2	— 0.9	89.2	32.9	3.09	15	+ 1.15	1.51	29	129	
Ashburton	323	57.7	— 0.1	91.8	33.2	2.95	10	+ 0.75	1.36	11	116	
Timaru	56	56.6	— 0.8	82.7	36.2	2.05	12	— 0.08	0.54	14	112	
Alexandra	520	56.8	— 0.8	85.0	38.0	2.26	12	+ 1.11	0.77	11	163	
Taieri	80	53.4	— 1.8	80.2	32.9	3.52	11	+ 1.45	1.47	12	126	
Invercargill airfield	0	52.2	— 1.6	75.2	31.6	2.29	13	— 1.74	0.88	27	130	
Chatham Islands ..	150	55.8	— 0.6	69.1	34.1	5.97	19	+ 3.41	1.33	15	—	

New Weather Forecast Districts

BECAUSE the district names used in weather forecasting have not been entirely satisfactory to either the public or the weather forecasters, the New Zealand Meteorological Service, since 21 March, has been using a new map of weather forecast districts (reproduced on this page). Though the new boundaries and names probably will not please everyone, it is hoped that generally they will be regarded as an improvement.

WEATHER forecasts for some 20 districts were first broadcast in New Zealand shortly after the end of the Second World War. As far as possible boundaries between districts were based on meteorological considerations and what appeared to be the most suitable names were given to the districts.

The selection of appropriate names has never been easy. For example, the provincial districts, still shown on modern maps of New Zealand, are generally unsuitable as basic weather divisions, and the counties are too numerous and mostly too small to be used for defining weather districts. A

further complication is that some counties have the same names as provincial districts but different boundaries, and some well known districts, such as the Waikato and the Manawatu, are not really defined at all. In spite of these difficulties the Meteorological Service in the past has thought it better to use these well known names than to use unfamiliar names.

On the new map the North Island is divided into four major regions—Northern, Central, Western, and Eastern Districts. The sub-districts into which these regions are now divided do not, in the north, east, and south

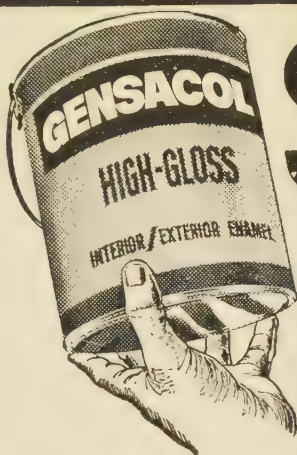
of the island, differ much from those previously used, but in the central parts considerable changes have been made. Taumarunui, roughly the same as Taumarunui County, consists of parts of the old North Taranaki and National Park-Taihape. Taupo, approximately Taupo County, includes the southern part of the present Rotorua-Taupo and part of the National Park-Taihape. The remainder, the southern part, of the Central Districts is now called Taihape. The boundaries of Waikato and Bay of Plenty have been moved southward, the latter to take in Rotorua.

In the South Island, Marlborough is split into three sub-districts and Fiordland, previously part of Southland, is now in "the West Coast of the South Island". South Otago has been extended north-westward and the district previously called Coastal Otago is renamed Dunedin.

With the new map in front of them most listeners should have little difficulty in deciding which forecast to listen to. Those near a boundary should realise that the weather is often no respecter of fixed lines drawn on a map by the Meteorological Service and that it will be best to listen to forecasts for adjoining districts. With experience and careful observation people in this position will probably be able to decide for themselves which forecast most concerns them.



[Map by Department of Lands and Survey]



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Hot Room for Liquefying Honey

CRYSTALLISED honey can be liquefied on a fairly large scale by using hot water or hot air as a heating medium. In this article L. H. JOHNSON, Apiary Instructor, Department of Agriculture, Palmerston North, describes a fireproof room heated by electric elements. It has been installed and is operated by Mr E. A. Field of Foxton. The liquefying of several hundred tins of honey without mishap in this hot room has shown the advantages of the system employed over the hot water method. Economy and convenience of operation are the main features. This system or modification of it would seem likely eventually to supersede the hot water method, but good management and watchfulness on the part of the operator will always be of prime importance.



OPERATING costs of the unit are much less than those for the steam boiler and hot water type and there is not the same waste of tins through rust. Heating is started simply by turning on an electric switch; an electrically driven fan distributes the heat, and a thermostat stabilises it.

A warm room often referred to in connection with honey production is one used to raise the temperature of honey in the comb to about 100 degrees F to make extracting and straining easier. The term hot room should not convey the impression of baking heat, but simply of stepping up warm room temperature to the minimum required (130-140 degrees) to turn crystallised honey into liquid in a reasonable time.

Construction Details

Under the roof of the main apiary building a small room 6 ft 6 in. x 6 ft x 6 ft 4 in. high (inside measurements) was built of concrete with the floor 2 in. higher than that of the adjoining room. The 6 in. thick walls and ceiling were built of pumice 3 parts, sand 3 parts, and cement 1 part. Steel reinforcing rods were necessary for the ceiling.

Extra insulation on top was provided by extending the side walls up to form a surround (in section 3 in. x 3 in.) and spreading dry pumice 3 in. deep over the ceiling. Before the walls were poured a door jamb of 3 in. x 2 in. timber was placed in position with bolts projecting into the walls for fixing.

The Door

A door 6 ft 6 in. x 2 ft 6 in. was built of multi-plywood $\frac{3}{4}$ in. thick. To the inside of the door was fixed a sheet of reflecting aluminium foil and over this a sheet of asbestos cement board, which was packed out $\frac{1}{4}$ in. from the aluminium foil.

Hinges were made by bolting two strips of steel 2 in. wide and $\frac{3}{8}$ in. thick and rolled at one end across the outer surface of the door.

The door was swung by passing $\frac{1}{2}$ in. bolts through the rolled ends and fixtures on the door jamb. At the opposite end of each metal strip a slot was cut to take a $\frac{1}{2}$ in. hinged bolt fitted with a wing nut so that the door when shut could be screwed up tight.

On the inside edges of the door an asbestos gasket was fixed to form a tight seal. As the floor of the hot room is 2 in. higher than that of the adjoining room, the concrete edge at the

← Tier of tins inside the hot room.

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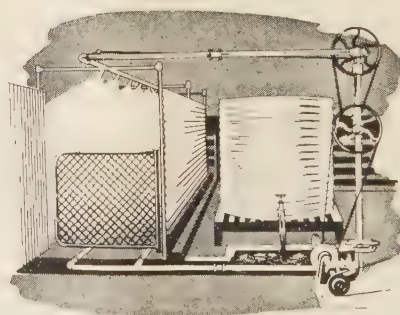
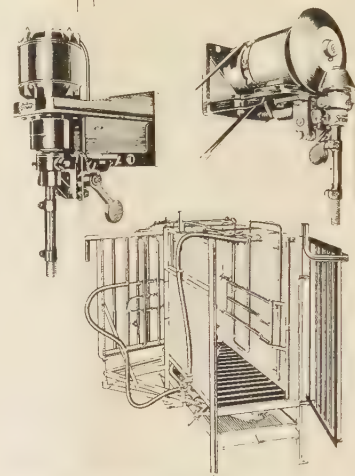
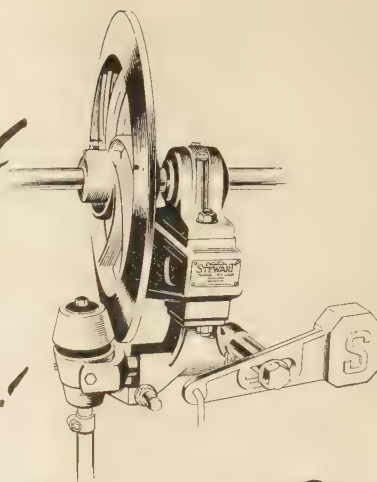
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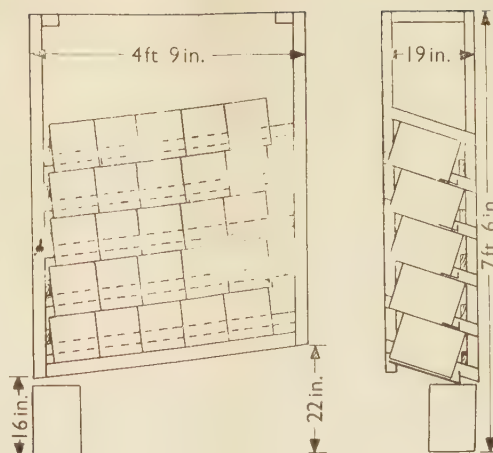
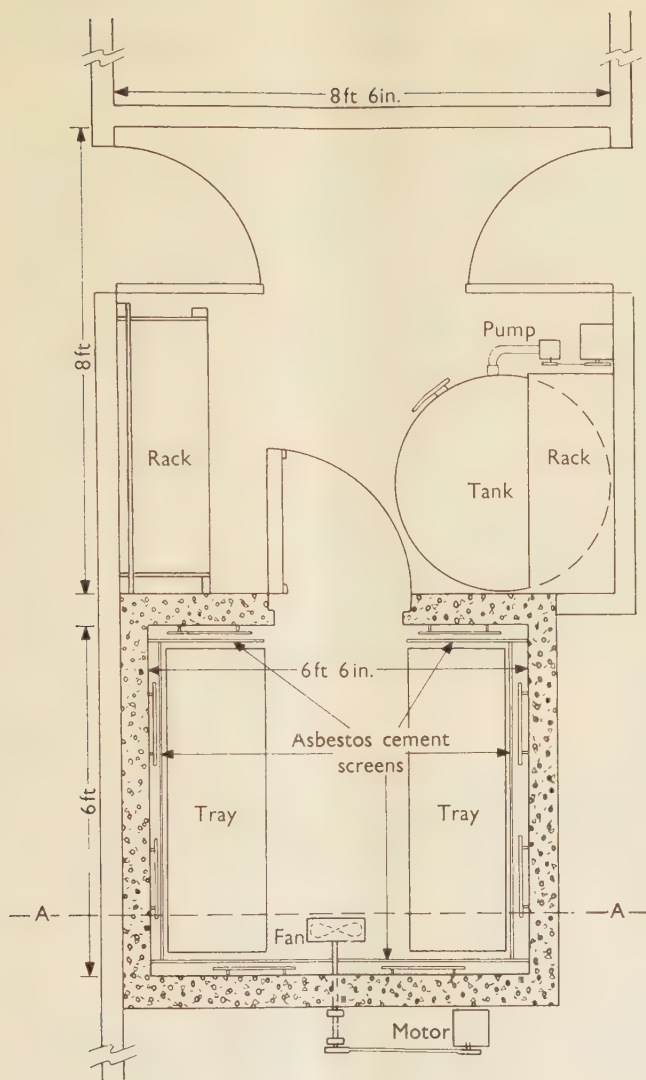
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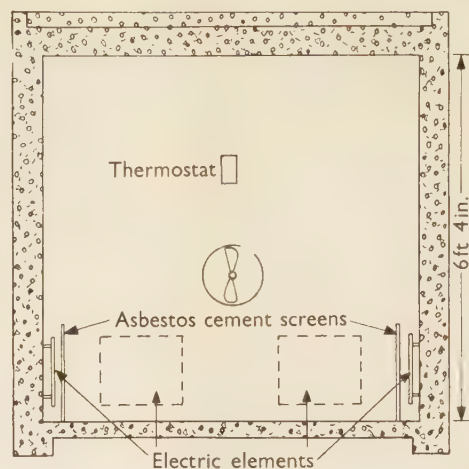


HOT ROOM FOR LIQUEFYING HONEY



ELEVATION OF RACK

END SECTION



SECTION A-A

doorway was faced with a piece of angle iron to prevent chipping of the concrete. When the door is shut the lower edge with gasket is 1 in. below this ledge, giving the door a clearance of 1 in. when open.

System of Heating Electrically

Electric heating elements may be of one of several designs provided they are completely encased to be shock-proof and are of a low wattage that will not run at a high temperature. Use of 1000 watt elements would give excessive localised heat. What is wanted is several low wattage elements giving a large heating surface. Eight 500 watt panel elements 16 in. x 14 in. x $\frac{3}{8}$ in. thick were used and are very satisfactory. These elements are made of a heat-resisting substance incorporating asbestos with a nickel-chromium alloy wire imbedded in the centre in a zig-zag pattern. The panels do not take up much space and are easily fixed in position. They were

attached two to each wall 6 in. up from the floor and wired through a thermostat placed halfway up the wall.

Four of the elements may be switched off after the temperature rises to the desired level. The thermostat is set to maintain an average temperature of 140 degrees F. For a further check on temperature a dial-type thermometer was inserted in a $\frac{1}{2}$ in. hole drilled through the wall near the door. The sensitive end of the stem projects 1 in. inside the hot room and the clock-face recording portion is on the outside.

Distribution of Heat

A type of motor with direct-coupled fan specially designed to operate in temperatures ranging from 120 degrees to 250 degrees is made, but as one was not readily available an ordinary $\frac{1}{4}$ h.p. electric motor was set up on the outside of the hot room wall and coupled with a $\frac{3}{4}$ in. diameter

shaft to a fan inside the room. This allowed all bearings to be in atmospheric temperatures and therefore not in danger of seizing up through overheating.

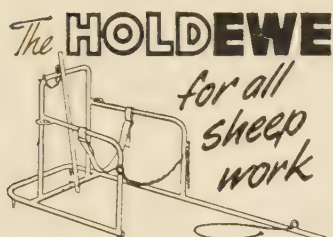
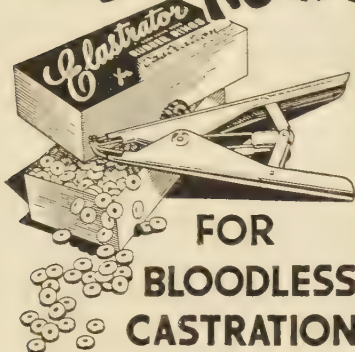
It is important to have the fan 3 in. away from the wall and to have a cowl about 4 in. wide encircling the blades. The fan can then pull air through the cowl and propel it in one direction.

Though the fan was set near the ceiling with an air trunk so that air from the floor could be drawn up and blown over hot elements under the ceiling, it appears that this arrangement may not be necessary and that the fan may be placed in any convenient position, even near the floor. As long as the fan maintains air turbulence the temperature throughout the enclosed space will be fairly even. A 10 in. fan driven at the same speed as the motor appears to be satisfactory.

To prevent direct radiation of heat on to the tins of honey nearest the

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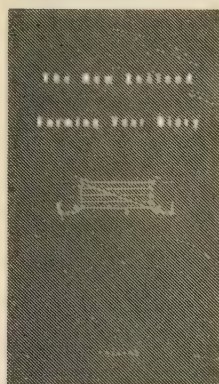
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electric elements, sheets of asbestos cement board were placed between the sources of heat and the honey containers.

Capacity

Usually a loading consists of 96 tins each holding 60 lb of crystallised honey selected for blending. These are all set in two metal trays 3 in. deep, one on each side of the doorway. Damaged tins may leak when the honey is liquefied, but with this provision no honey need be lost as so often happens when tins of bulk honey are liquefied in hot water.

Time and Cost

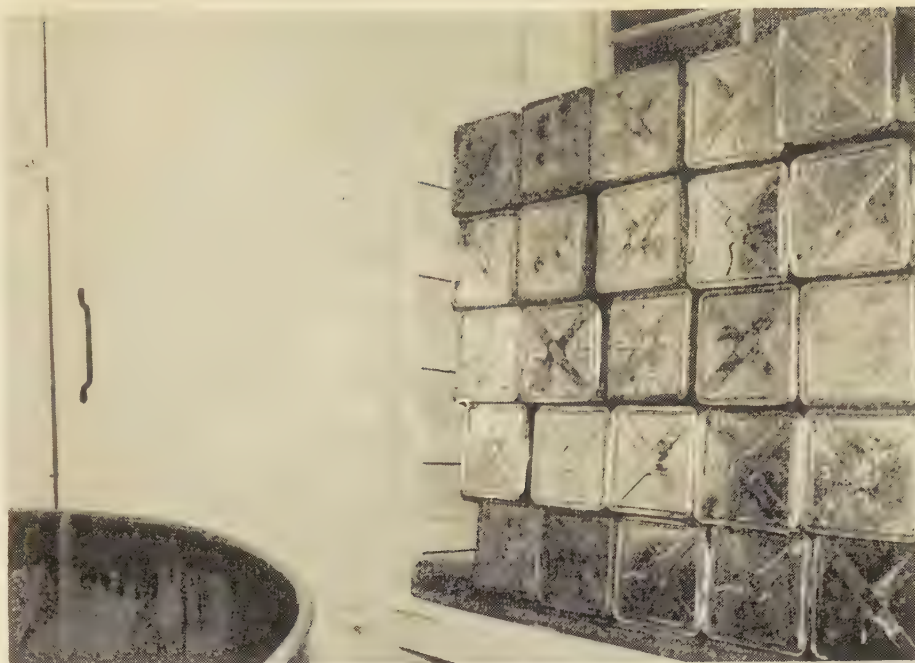
It takes one man about two hours to load in 2 tons of honey in bulk containers. All elements are then switched on, but when the thermometer registers 140 degrees only four elements are needed. From a cold start it takes 60 hours to liquefy completely. Electric power has cost about 5s. per ton of honey.

Tank and Draining Racks

A room 8 ft x 8 ft 6 in. x 9 ft high adjoins the hot room. The floor is of concrete and the walls and ceilings of timber lined with hardboard. In this small room is set up a honey tank, pump, and draining racks. As the space is limited, each piece of equipment has to be worked out to a nicety to fit in.

The honey tank and small draining rack. The use of clear plastic piping from the honey pump makes it possible to compare the colour of honey in the pipe with a sample.

HOT ROOM FOR LIQUEFYING HONEY



The main honey draining rack.

The honey tank with a diameter of 3 ft 10 in. and height of 2 ft 6 in. holds 1 ton of liquid honey. It is set on a stand 5 in. above the floor. The tank, 3 ft high at the top, is at a convenient height.

Liquid honey in 60 lb tins is taken from the hot room and poured through a strainer into the tank. The tins are then set on a frame of 3 in. x 2 in. timber which lies across the tank and left there for a few minutes to drain. No further manual labour is required, as the pump will deliver honey into tanks on a higher level in the adjoining honey packing room.

Draining racks have been specially designed so that every ounce of honey may be recovered from the tins. As the space is limited, one rack has been built on the wall and a smaller one is set above the tank. Both the draining racks are hung from the ceiling and provide for a two-way fall for each tin. At the bottom of each rack is a metal tray which will deliver honey to the lower end. Each tin is pierced on one corner with a nail.

A row of tins for final draining is placed on the rack with the nail holes down. Then a draining tray is set on top of this row to take the drips of honey from the tier of tins above. Similarly each row of tins added will have a tray under the outlet. Each tray in section is 9 in. wide and 3 in. bent



(Continued at bottom of page 464)

HONEY HOT ROOM . . .

up vertically to form a channel and is the same length as the rack.

The lower ends of the trays project clear of the rack so that drips of honey can fall into a 60 lb tin set on the floor. If the initial draining of free running honey is good, there will be less than 60 lb of honey from 40 tins.

Honey that drains from the tins on the rack above the tank is directed to run into the main bulk of honey. It has been found that the tank full of warm honey will keep the atmosphere about the right temperature to facilitate almost perfect drainage from the tins on the racks. Tins put back in the hot room to drain would dry out too quickly, leaving a film of honey baked on to the inside surfaces.

Avoiding Blockages from Tree and Plant Roots in Tile Drains



MOST trees and some plants such as chou moellier will send their roots into tile drains. Deciduous trees such as willows and poplars are recognised as being particularly liable to affect drains and have been known to send their roots for distances of 2 to 2½ chains into tile drains in search of moisture.

Evergreen trees such as pines and macrocarpas are seldom considered as a threat to drains, but the photograph shows macrocarpa roots taken from a tile drain. They extended for about a chain into the paddock from the plantation.

All trees should be considered with suspicion when tile drainage systems are installed and tile drains should be kept at least 2 to 2½ chains away from deciduous trees and 1 to 1½ chains from evergreens.

Chou moellier may also seriously affect drainage and blockages have been known to occur two years after the paddock which was in chou moellier was resown to grass. Apparently the roots did not decompose and the water carried them down the drain to some place where they were caught up and accumulated.

Chou moellier roots have also been found blocking a tile drain installed 5 ft down in heavy clay. Paddocks which have tile drainage systems in them and are to be sown to chou moellier should have a strip of swedes, turnips, or a green feed sown over the drains.

In some districts with very dry summers such as Hawke's Bay rape may also send roots into tile drains in search of moisture.

—K. L. MAYO,

*Farm Advisory Officer (Farm Drainage),
Department of Agriculture,
Palmerston North*

Washing Tins

Tins that have been used should not be left long before washing. Honey left for some time will attract moisture, which will set up chemical action and remove the tinning.

A simple but effective way of washing tins is to submerge them in cold water for a few hours. After being rinsed with fresh water they may be turned upside down and left to drain dry.

Prolonged Heating May Darken Honey

Honey may be scorched or coloured if sufficient heat is applied to liquefy it quickly. Not only excessive heat, but also keeping honey after it has been liquefied in a rather warm atmosphere tends to darken it. As soon as honey is liquefied it should be removed from a warm atmosphere.

The worst darkening of honey can occur through the black substance which develops round the tops of tins getting mixed with honey as it is poured from the bulk container. This acid action of a film of honey on metal often occurs when bulk supplies have been stored for two or three years. It will pay to remove all the lids before honey is liquefied and examine the top of each tin. Any rusty or discoloured surfaces should be cleaned thoroughly.

Photographs by Ivan Oxnam.



"Educating Your Dog": Colleen M. Cooper

MRS COOPER'S knowledge, wide experience, understanding, and love of dogs have enabled her to describe, clearly and simply, sound training methods which show how a dog's natural talents and inherent ability can be developed by kindness, consistency, and understanding.

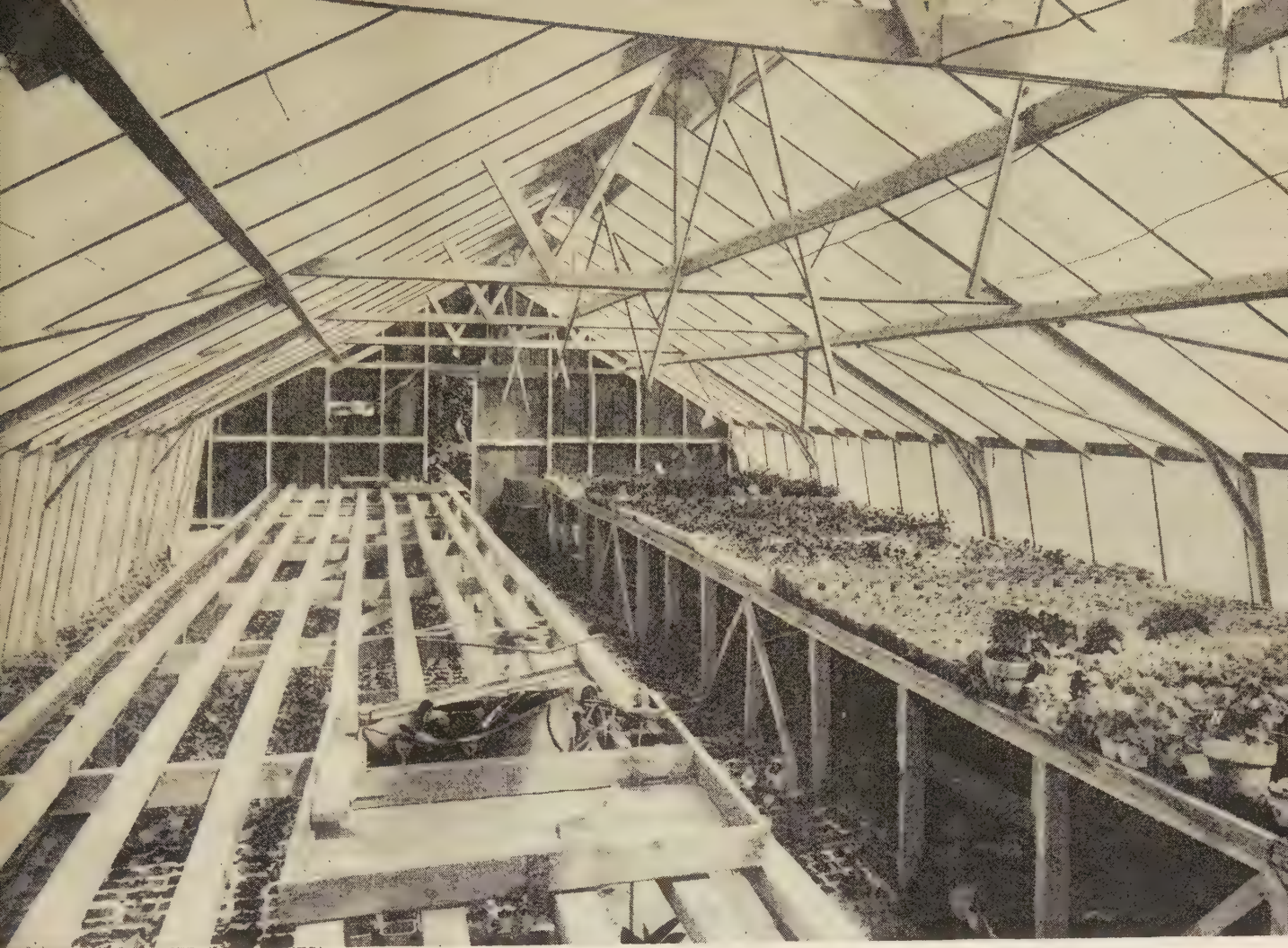
The book describes in detail dog training methods for obedience tests and should be invaluable to anyone wishing to take part in these competitions or in gun-dog trials in the field.

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In her own words, "This book is an attempt to help those who are keen to educate their dogs, especially those who have had no previous experience in the training and handling of dogs . . . A well trained dog like a well behaved child is a joy to know".

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A plastic house, showing the ridge structure. Because of condensation a plastic house should have a steeper angle than a glasshouse to ensure water run-off.

Plastics for Greenhouses and Frames

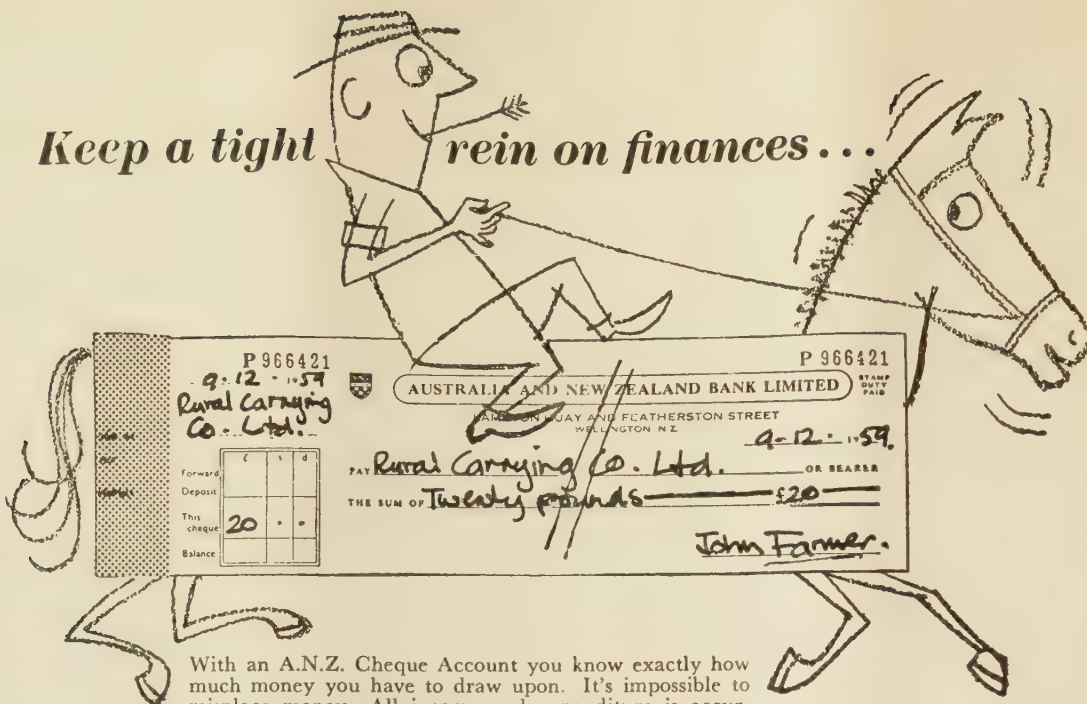
By W. BRANDENBURG,
Horticultural Instructor, Department of Agriculture, Christchurch,
and S. CHALLENGER,
Lecturer in Horticulture, Canterbury Agricultural College

PLASTIC films are being increasingly used by commercial horticultural producers. This article discusses the information gained in New Zealand to date on the use of transparent plastic film as a substitute for glass on greenhouses and frames. As the information is incomplete as yet and does not rest on solid experimental evidence, the article is intended to be a guide only to those planning to use plastic films so that they may have some idea of what can be expected from their use.

MANY types of chemically and physically distinct plastics are available today. The following are transparent plastics in commercial production, though not all are in the form of film, which is the most useful horticultural formulation.

Trade name	Material
"Garnite" "Visqueen" "Thermoplus" "Armathene"	Polythene
"P.V.C."	Polyvinylchloride
"Perspex"	Polymethyl acrylate
"Cellophane"	Regenerated cellulose
"Polystyrene"	Polystyrene
"Celawrap Q"	Cellulose acetate

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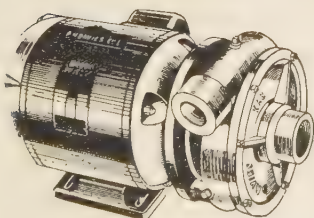
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Of these materials, polythene is the plastic film most readily available in New Zealand. The uses of plastic sheeting in horticulture and any merits or disadvantages it has were investigated in the Hamilton and Christchurch districts. The main use so far has been for covering greenhouses and frames and making cloches, generally using clear polythene of 5/1,000 in. thickness as a glass substitute.

The number of structures observed is unfortunately still small. At present eight structures, some with more than two years' use, are being closely observed. The possibility of error in this kind of general observation is therefore still large, and the following report is confined to features that have been consistent and clear in all or most of the structures observed. Where possible these observations have been correlated with the recorded physical properties of polythene and other materials.

Construction

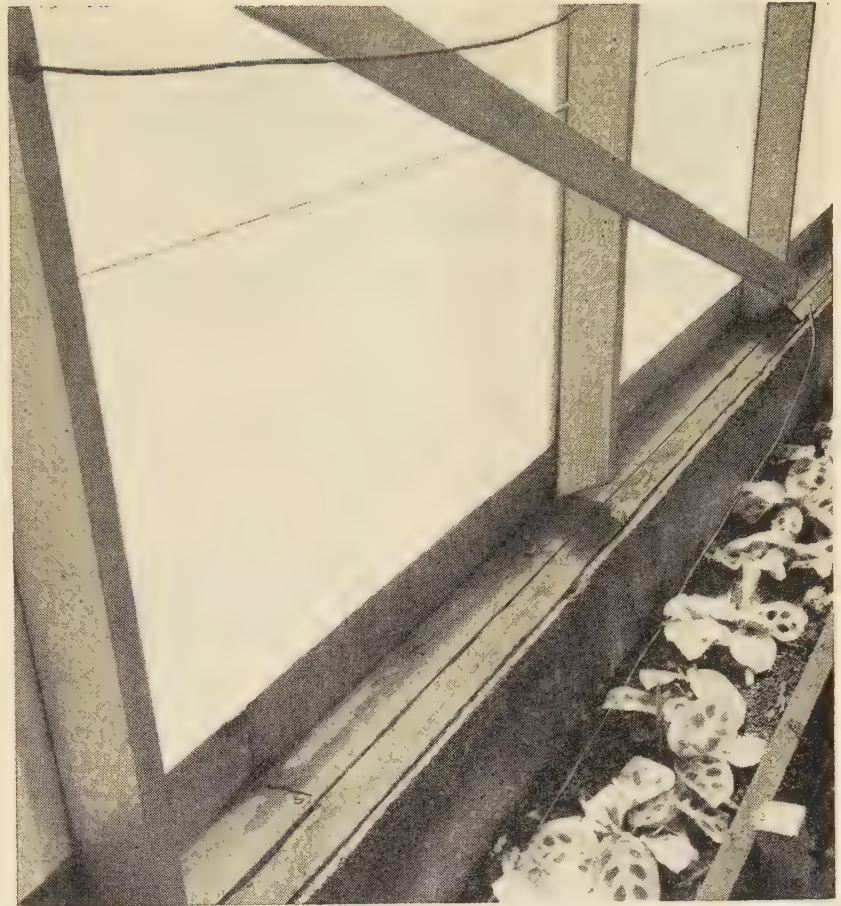
The way in which glass and a glasshouse are of value to the crop inside is worth discussion as a preliminary. First, the warmth from the sun and sky, as short-wave radiation heat and light, penetrates the glass and warms the soil, air, and plants inside the house. Secondly, the glasshouse insulates the materials within from heat loss due to convection. Thirdly, the glass itself is opaque to the re-radiation of heat from within the house. Heat given off by the glasshouse contents as low temperature, long-wave radiation is reflected back by the glass and retained inside the house. (This is distinct from heat loss from the glasshouse due to direct conduction through the glass.)

Thus, the heat increase inside a glasshouse is due to the minimisation of convection heat losses during the day and to the retention at night of heat reradiated from the soil and plants. Any substitute for glass must act similarly to be effective.

Glass is brittle and heavy, though it has an indefinite life. Plastic films are light and pliable and their general adaptability makes them ideal for glasshouse construction. Polythene 5/1,000 in. thick, for example, is one-sixtieth the weight of glass, so that a 100 x 30 ft house, which would require 6 tons of glass, would need only 2 cwt of polythene. This means that structures for plastic can be much lighter (and therefore cheaper) than for glass.

Stability of House

Nevertheless, it would be dangerous to assume that as the structure of the house or frame is lighter, the foundations can be lighter too. Foundations



Instead of a sill plate this plastic house has a bottom plate of angled galvanised sheet iron. The horizontal part of the plate is attached to the concrete sill and on the vertical part the uprights are screwed.

of plastic structures have a reverse function to those of glass structures; they do not support so much as hold down. Skimping on the foundations can easily mean destruction of the entire house, and it definitely pays to trust nothing but a reasonably heavy, continuous concrete sill. Anything less substantial may fly off with the house in a gale.

For plant frames the posts supporting the sides must be sunk well into the ground.

The house must be well tied down to the foundations also, and it is here that an improvement on glasshouses can be made. Instead of a sill plate, which may rot, strips of heavy-gauge galvanised sheet iron can be used; the strips are folded lengthwise at a suitable angle and one side is bolted on to the concrete sill, the other side standing up to have the uprights of the house directly screwed on to it. All upright timber is kept an inch or more clear of the concrete sill. No dampcourse is needed and a source of decay is eliminated.

A "glass" house gets an important part of its stability from weight, but the plastic greenhouse lacks this weight and for that reason the framework must be adequately strong and well braced. As there is little weight to carry, however, most of the stresses will be pull and bending movements and a lot of the bracing can be done safely with fencing wire and wire strainers. Galvanised sheet iron can play an important role in bracing corners and simplifying construction.

However (and this is an important consideration) the plastic covering must be nowhere in direct contact with metal parts of the structure. During summer metal parts, including even No. 8 gauge wire, will heat sufficiently in the sun to cause failure of plastic touching it. This happens even when the plastic carries shading.

Ventilation

Plastic houses are generally perfectly airtight and the air in them

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tends to be humid. Condensation is a problem. Under direct sunlight the temperature in a plastic house also tends to be higher than in a glass-house. Both these problems can, however, be greatly minimised by proper ventilation. Continuous side vents consisting simply of a hinged 6 in. board under the eaves, and a continuous ridge ventilator, if possible about 12 in. wide and of the type that lifts up completely, appear the best, and can be built into most structures easily. It has been shown that the houses can be kept free of condensation with this type of ventilation if handled properly. Frames seldom give ventilation problems.

The surface texture of plastics as well as the increased humidity causes drips. Water condenses on plastics in the form of droplets, not as a film as it does on glass. Consequently a plastic house should have a steeper roof angle to ensure water run-off and to reduce drips. Doors should be light, and if the more convenient sliding doors are used, they must be held firmly when shut. If they blow out, serious damage results quickly.

The size and shape of the bars on which the plastic is fastened are immaterial. Depending on support and length, a range of different timber sizes has been found satisfactory. The roof must be able to support as a minimum the weight of two men working close together, as the plastic must be renewed regularly, but extra strengthening is required if the roof also acts as crop support. Battening the plastic on to the bars, nailing at least every 6 in., appears to be the most satisfactory way.

The timber surface of the bars and battens where in contact with the plastic must be left rough sawn. Plastic slips readily from between dressed timber surfaces. It is also advisable to use a soft timber such as pinus, as its slight sponginess ensures a better grip. Rusty nails hold better than new ones, and, if available, the double-headed type may be preferred for easy replacement. Stapling the plastic or screwing the battens has not been satisfactory.

English-made plastic is 5 ft wide, and New Zealand-made 6 ft wide. Both are too wide to leave unsupported. Bars at slightly under 2 ft 6 in. and slightly under 3 ft respectively are most satisfactory.

Characteristics of Plastic

The life and cost of plastics are important. Polythene (0.005 in. film) costs about 2.8d. per square foot and glass 20 x 20 in. is about 1s. 4d. per square foot or five and three-quarter times the cost of polythene. A short life can be tolerated if the cumulative replacement cost is low.

It has been proved at Hamilton and Christchurch that polythene sheeting on the roofs of structures cannot be relied on to last more than one year. Slow oxidation gradually reduces the strength of the film and it then tears easily. Sheeting on the sides of houses appears to last longer and may last two seasons. Replacement of roof films is therefore an annual task and it should preferably be done on a hot day when the film has the greatest stretch.

The season when the plastic is applied affects the life of the plastic, and films replaced in autumn may have a longer life owing to the reduced amount of ultra-violet light to which they are exposed in their early life. Oxidation occurs in the presence of ultra-violet light, and the rate of oxidation is roughly proportional to the exposure to sunlight.

Unfortunately, the New Zealand-made types of plastic are all sold on rolls 3 ft or less wide. The 6 ft-wide kind generally used is sold folded double on a 3 ft roll. This fold is a cause of premature failure as the plastic splits along it. The effects of this can be minimised by applying the plastic to the house lengthwise, with generous overlaps, working from the bottom up as if weatherboarding a

house. The older method of applying it in strips vertically from top to bottom results usually in this fold running over long unsupported stretches.

However, the most important peculiarity of polythene and its biggest disadvantage is that it offers little or no protection against radiation frosts. A series of observations of frost damage under polythene shows that quite a few growers who wanted to use the plastic as protection in winter have been disappointed in the results.

This peculiarity may be explained by an examination of the heat and light transmission properties of glass and plastics. The range of ultra-violet light is less than 0.4 microns in wavelength; light used in photosynthesis, which is approximately the same as that visible to the human eye, lies between 0.4 and 0.75 microns. The warmth and light from the sun lie in the short wavelengths between 0.3 and 3.5 microns, while the heat radiated by low temperature bodies such as the earth is in the long wavelengths from 6.5 to 16 microns. Glass is transparent only to the range of short wavelengths between 0.32 and 3.5 microns, and then only to the extent of about 50 per cent. Polythene, on the other hand, is about



The eaves and part of the end structure of a plastic house.



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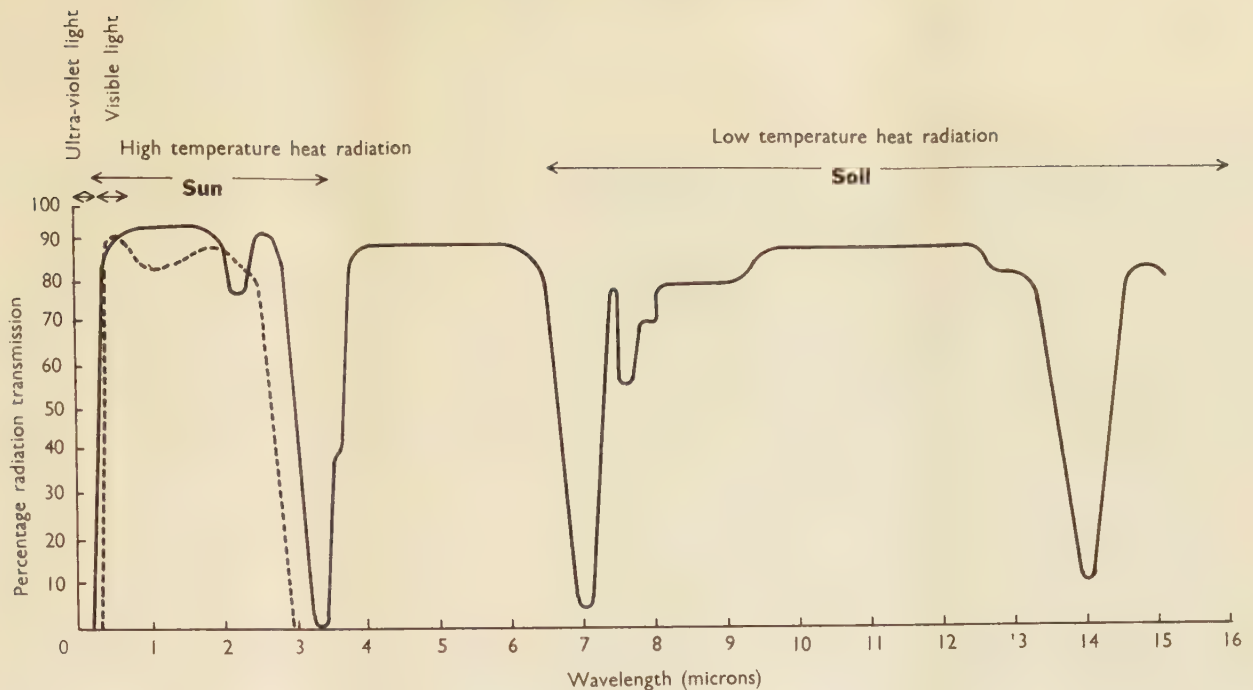
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PLASTICS FOR GREENHOUSES



Radiation transmission through glass is shown by the dotted line and through polythene by the solid line.

90 per cent transparent to almost the whole range of wavelengths between 0.23 and 16 microns.

The diagram above shows that it does exclude transmission at about 3, 7, and 14 microns, but these points are only a small proportion of the range 0.23 to 16.

It can be seen from this that glass is opaque to the long-wave soil radiation which occurs in radiation frosts, while polythene is 90 per cent transparent to it. The transmission of visible light is about the same in both, with polythene allowing the passage of more ultra-violet light than glass. Thus, though polythene admits adequate light for photosynthesis, it has no ability to prevent loss of heat which has been bottled inside a plastic structure during the daytime as a result of short wavelength heat transmission from the sun. However, it is interesting to note that a water film 0.002 in. thick retains radiation heat much better than polythene, so that polythene with a film of moisture over it is almost as effective as glass. The increased amount of ultra-violet light passing through polythene compared with glass is sometimes stated to be an advantage, but ultra-violet light is of little importance to plant life, except that it is slightly detrimental.

Some of the more modern plastic films, such as "Kodapak", "Linapal", "Mylar", and "Melinex" (which are not at present available in New

Zealand), have much better heat-retention properties than polythene. All are expensive, however—almost the same price as glass—so that the future of these materials, assuming they have adequate weathering properties, depends on the extent to which their use can reduce the cost of construction of the framework carrying them.

When heating plastic houses sources of heat relying on radiation, such as hot-water pipes, are practically useless according to New Zealand experience. The heat radiated passes straight out of the houses. Probably hot air methods are the most efficient form of heating, since they rely on convection only. A fan working during cold nights without the addition of actual heat may improve frost protection. A plastic house is no worse than a glasshouse for conduction heat losses, and is probably better, from the point of view of convection heat losses, as there is no leakage through laps between panes.

Growing Methods and Crops

Growing methods in plastic houses may require slight modification compared with those in glasshouses. Reduced watering and greater ventilation will be required owing to the retention of water vapour, and the higher humidity may be a problem. Foliage or flowers should not touch the plastic or decay is very likely.

The following crops have been tried under plastic:

Tomatoes: Successful, subject to adequate ventilation and proper heating arrangements. Tomato leaf mould has been found to occur later in plastic houses than in glasshouses, possibly owing to the effect of the increased transmission of ultra-violet light, which is recognised to be detrimental to fungi.

Cucumbers: Ideal. They are very much at home in the close, humid atmosphere under plastic.

Lettuce: Successful, subject to adequate ventilation and disease control.

Cut flowers: Very good for summer protection to ensure unspotted quality blooms. Structures with open sides are preferable.

Bedding plants: Heavy losses were experienced by the Christchurch City Council, which tried to overwinter such plants as geranium, iresine, fuchsia, etc., under plastic. High day temperatures, high humidities, and frost at night were too much for the plants.

Pot plants: Successful with cyclamen. No trouble with damping off or spotting of the blooms.

Summary

In any judgment of the usefulness of plastic film on structures used for growing plants in commercial horticulture, economics play a decisive role. On the other hand, this side of

the picture is the most difficult to judge, as so many unknown factors are involved.

We could, for instance, try to compare the costs of building a conventional glasshouse and a polythene house of similar dimensions. In both cases the cost is strongly influenced by the amount of work the grower can do himself or with his own staff. Also, variations in the actual purpose of the structure—for instance the requirements of crop support—have an important bearing on the strength and therefore the cost of the structure. There is not nearly enough information available to make a reliable overall estimate of the economics of the subject and any suggestions offered here must be taken with considerable reserve.

Cost of materials for a standard 30 x 100 ft glasshouse in Christchurch is between £600 and £800. Cost of materials used in the structure alone of a plastic house of the same dimensions would be between £150 and £300, depending mainly on the amount of crop support to be incorporated. In addition, the cost of the plastic alone for covering would be between £50 and £60, and this would be an annual expense. As already stated these figures must be taken with a large amount of reserve and they apply to the Canterbury district only, no figures being available from other parts of the country.

They illustrate a trend, however, and that is: for **permanent** structures, because of the annual cost of re-covering the houses with new plastic, **a plastic house will in eight to 10 years have cost just as much as a glasshouse.** On present knowledge it seems best to use plastic only in the field for which it is inherently most suitable and that is for light, temporary structures.

The use of plastic film for temporary shelter could be very profitable when the reduction of convection heat losses or losses due to wind is more important than reduction of radiation losses. Spring or autumn use would be excellent to hasten a crop or prolong a season. Plastic-covered structures which could be moved from place to place would be of especial value to the beginner with very little capital. It is felt at the moment that it is in this field that plastics are most likely to be valuable, rather than as alternatives to glass in orthodox glasshouse construction.

ACKNOWLEDGMENT

The authors thank growers in the Waikato and Canterbury areas who have freely related their experiences and permitted observations in their plastic structures.

Photographs by Mr R. C. Blackmore.

RADIO broadcasts for farmers will be given during June as follows:

IXH Hamilton, 12.33 p.m.

13 June—"What has the Y.F.C. to Offer?", by the Waikato Y.F.C. district committee.

20 June—"Recent Research on Potash", by D. E. Hogg, Senior Scientific Officer, Department of Agriculture Rukuhia Soil Research Station, Hamilton.

27 June—"Farm Profits and Taxes", by J. M. Miller, Farm Advisory Officer (Economics), Department of Agriculture, Hamilton.

IYZ Rotorua, 7.15 p.m.

1 June—"Sprays for the Prevention of Pre-harvest Drop of Grapefruit", by B. M. Piper, Horticultural Instructor, Department of Agriculture, Tauranga.

15 June—"Rearing of Dairy Calves", by K. G. B. Wilson, Livestock Instructor, Department of Agriculture, Opoiki.

29 June—"Planning Farm Expenses for the Year", by S. D. Clay, Farm Advisory Officer, Department of Agriculture, Matamata.

2XG Gisborne, 8 p.m.

7 June—"Stockowners' Question Time", by E. B. Smythe, Livestock Instructor, Department of Agriculture, Gisborne.

14 June—"For the Orchardist", by J. Overbye, Instructor in Horticulture, Department of Agriculture, Gisborne.

21 June—"Erosion Control Methods", by A. Metsers, Soil Conservator, Poverty Bay Catchment Board.

28 June—"Preparation of Farm Sheepskins", by R. W. Scaife, Sheep and Wool Instructor, Department of Agriculture, Gisborne.

2YZ Napier, 7.10 p.m.

7 June—"Practical Hints to Poultry Keepers", by H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings.

21 June—"Some Thoughts about Mole Drainage", by E. W. S. Wilson, Fields Instructor, Department of Agriculture, Hastings.

2XA Wanganui, 8 p.m.

2 June—"For the Countrywoman", by Mary Macdonald.

9 June—"Farming News".

16 June—"Sheep and Wool Notes", by P. C. Marshall, Sheep and Wool Instructor, Department of Agriculture, Wanganui.

23 June—"Livestock Notes", by J. F. Muntling, Livestock Instructor, Department of Agriculture, Wanganui.

30 June—"Establishing a Market Garden", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Wanganui.

2XA Palmerston North, 12.36 p.m.

13 June—"Tile Drainage", by K. L. Mayo, Farm Advisory Officer (Drainage), Department of Agriculture, Palmerston North.

27 June—"Weed Control in Horticultural Crops", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Palmerston North.

2XP New Plymouth, 8 p.m.

2 June—"News and Views from the Department of Agriculture's Farm Advisory Division", by S. H. Henry, Farm Advisory Officer, Department of Agriculture, Stratford. "Y.F.C. Session", by David Smith, North Taranaki Y.F.C. district committee.

9 June—"Chick Rearing", by B. J. Russell, Poultry Instructor, Department of Agriculture, Wanganui.

23 June—"Radio Vet.", by J. H. Macdonald, Veterinarian, Department of Agriculture, New Plymouth.

3YA Christchurch, 12.20 p.m.

20 June—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.36 p.m.

13 June—"Hay is Valuable", by R. H. Smith, Farm Advisory Officer, Department of Agriculture, Invercargill.

20 June—"Oversowing Tussock Grassland", by S. M. J. Stockhill, Fields Instructor, Department of Agriculture, Palmerston.

27 June—"The New Zealand Weed Control Conference", by A. Stuart, Assistant Fields Superintendent, Department of Agriculture, Dunedin.

Regular Sessions

IYA Auckland, Mondays at 12.36 p.m.—"Country Journal", including "Report from Ruakura"; Tuesdays, Wednesdays, Thursdays, and Fridays at 7.45 p.m.—"Country Journal"; Thursdays at 12.33 p.m.—"News for the Farmer".

IXN Whangarei, Mondays at 8 p.m.—"Northland Stock Market Report" followed by "Farming for Profit"; Wednesdays at 8 p.m.—"Farming for Profit"; and Fridays at 12.33 p.m.—"Farm News".

IXH Hamilton, Mondays at 12.36 p.m.—"For the Farmer" (excluding first Monday in month and public holidays); Wednesdays at 12.33 p.m.—"Report from Ruakura".

IYZ Rotorua, Wednesdays at 7 p.m.—"Bay of Plenty Journal"; Thursdays, 12.33 p.m.—"News for the Farmer".

2YZ Napier, Tuesdays at 7.10 p.m.—"The Hawke's Bay Farmer"; Thursdays at 12.33 p.m.—"News for the Farmer".

2XG Gisborne, Tuesdays at 8 p.m.—"Farm Session".

2XP New Plymouth, Thursdays at 8 p.m.—"Farm Session".

2XA Wanganui, Mondays at 8 p.m.—"For the Man on the Land"; Tuesdays at 8 p.m.—"Farm Supplement"; and Thursdays at 8 p.m.—"Farm Topics".

2XB Masterton, Fridays at 6.45 p.m.—"Farm Session".

2XN Nelson, Thursdays at 8 p.m.—"Nelson Farm Topics".

2ZA Palmerston North, Mondays at 12.36 p.m.—"Country Digest"; and Fridays at 8.30 p.m.—"Country Digest" (including Fellding stock market report).

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m.—"Farm Session"; Thursdays at 12.33 p.m.—"News for the Farmer".

3YA Christchurch, Mondays at 12.20 p.m.—"Country Session"; Thursdays at 12.33 p.m.—"News for the Farmer"; and 7.10 p.m.—"Home Paddock".

3XC Timaru, Wednesdays at 8 p.m.—"Farmers' Weekly News Service"; and Saturdays at 10.30 a.m.—"Country Mailbag".

3YZ Greymouth, Mondays at 12.36 p.m., Thursdays at 12.33 p.m.—"News for the Farmer".

4YA Dunedin, Mondays at 12.36 p.m.; Wednesdays and Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.36 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m.—"News for the Farmer".

Flood Gates for Drainage Outlets

By D. F. SCOTT,
Machinery Instructor,
Department of Agriculture,
Auckland

A FLOOD GATE is a simple flap valve so arranged that water in a drain can flow only in one direction. Though flood gates are mainly used with outlets affected by tide, they can be used for drains discharging into rivers where water levels may rise temporarily owing to flooding.

THE flood gate prevents foreign water from backing up through a farm drainage system, but it has an obvious weakness in that while the gate is shut owing to high water level outside, drainage water will be trapped within the system. This may mean that internal drains may gradually fill up before the flood gate opens. The only way of overcoming this serious disadvantage is to use a pump in addition to the flood gate.

At least the flood gate will prevent outside water from loading the internal drains, and this is most important if the outside water is salty.

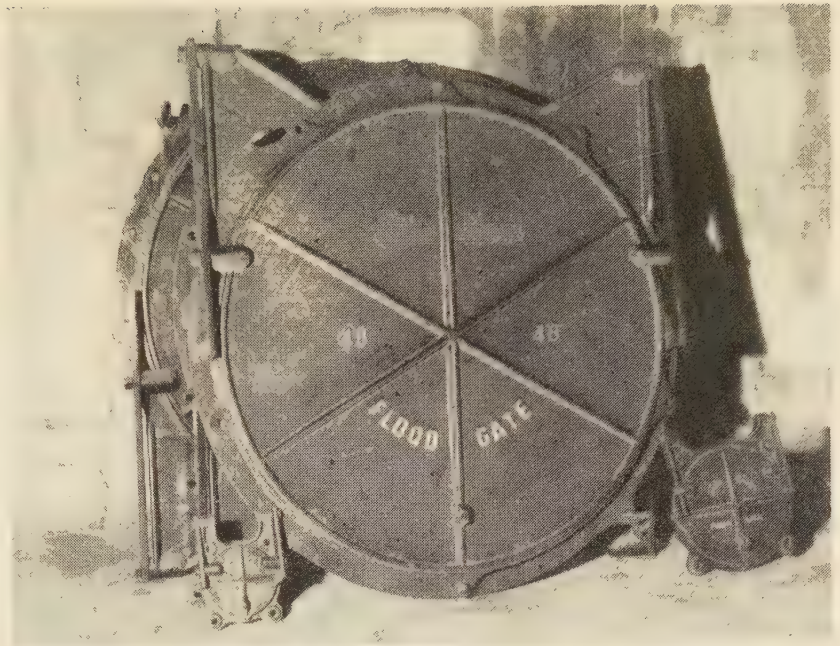
Types of Flood Gates

Satisfactory flood gates may be made from a wide range of materials, concrete, cast iron, and timber all being quite suitable. Concrete gates, though they are reasonably resistant to rotting and corrosion, are very heavy, and this may account for a greater loss in head owing to the pressure of water required to open them.

Cast-iron gates are very popular and the rate of corrosion, even in salt water, is not very serious. Where it is feared that corrosion of the flap and its seat may cause leakage these parts may be faced with bronze to give a corrosion-resistant seal.

Timber gates are not very often used these days because, unless they are treated with preservative, they are not generally as resistant to corrosion and rotting as is concrete or cast iron.

To assist gates to seat efficiently they are usually hung on special hinges which are free to move at both ends. Gates made of heavy material may be fitted with a counterbalance to reduce



The largest cast-iron flood gate normally available, with, at left and right bottom, two smaller ones.

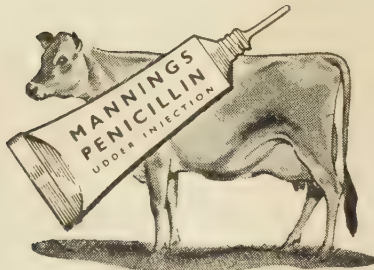
▼ A small cast-iron flood gate for mounting either on a concrete wall or on the end of a concrete or steel pipe.



▼ A reinforced concrete flood gate for mounting on the end of a concrete pipe.



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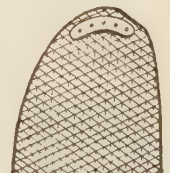
Whatever the weather, you'll get along swimmingly in Dryfoot—the boots with the duck on the tag.



NAILED LEATHER

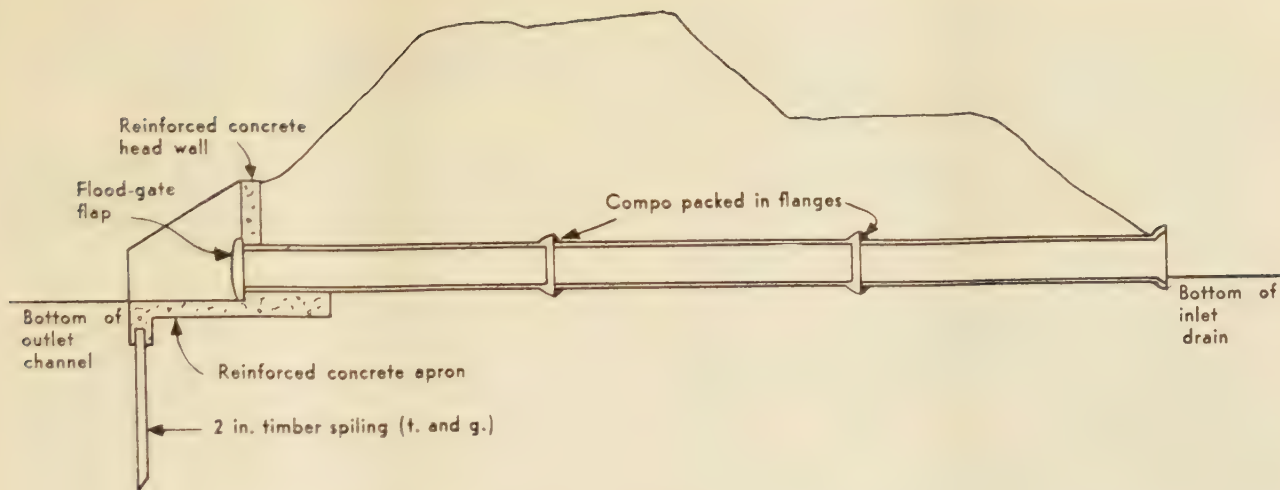


SHERPA RUBBER

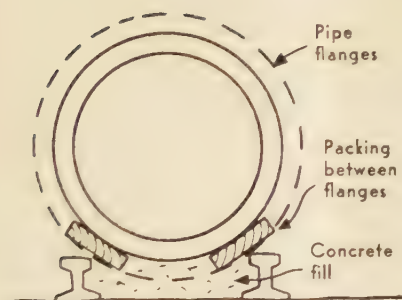


AVIAFLEX RUBBER

Made in N.Z. by Sargood, Son & Ewen Ltd.



Section through a flood gate, pipes, and surrounding bank.



Cross-section of pipes with cradle of tram rails and concrete fill.

line. A good method is to bed the pipes on two lengths of railway line, hard wood, or preservative-treated timber.

Commercially produced cast-iron or concrete flood gates may be either mounted on the end of a culvert pipe or fastened to a facing wall at the discharge end of the culvert. It is a good idea to allow plenty of pipe length to pass through the bank and to face the sides of the bank surrounding the pipe with concrete, stone, or timber to prevent subsidence and to prevent water leaking parallel with the pipe.

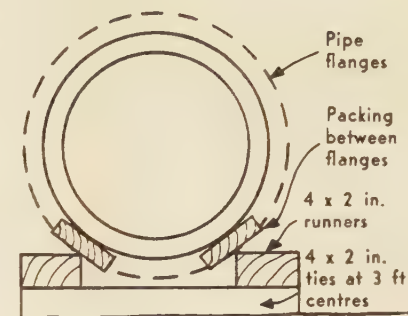
Some gates are fitted so that they hang vertical when closed and others are hung on a slight angle. A reasonably well fitting gate should be perfectly satisfactory if hung vertical, but on the other hand some gates have been installed with batters of up to 1 in 14. The more batter on the gate the greater loss of head there will be owing to the pressure required to lift the gate as the water flows through it.

Size of Gate

Commercially made flood gates in both cast iron and concrete are available from 6 in. up to 4 ft in diameter. The size of gate will depend on the area of land in the catchment feeding the flood gate outlet and on whether the catchment is steep and hilly or flat and swampy. One authority suggests that for average New Zealand conditions a fair guide to flood gate size would be 1 sq. ft. of flood-gate area per 20 acres of hill country or per 30 acres of flat country.

Operation and Maintenance

Few flood gates provide a complete seal against leakage, but this is not really important, because their main



Cross-section of pipes with an alternative cradle of preservative-treated timber.

Diameter of gate	Area of gate opening
in.	sq. ft.
6	0.2
12	0.8
18	1.7
24	3.1
30	4.9
36	7.0
48	12.5

the head loss due to the weight of the gate.

Installation

Most flood gate installations are associated with protective banking works, any weak or low place in which may give way and let water in in times of strain. Expensive flood gate installations can be completely wasted if there are any such weaknesses in the associated bank.

Most flood gate installations contain a considerable weight of materials and require adequate foundations to prevent movement or subsidence. It is sometimes necessary to drive piles to support a flood gate installation, but flood gates of a size likely to be installed in farm drainage works do not generally require such precautions.

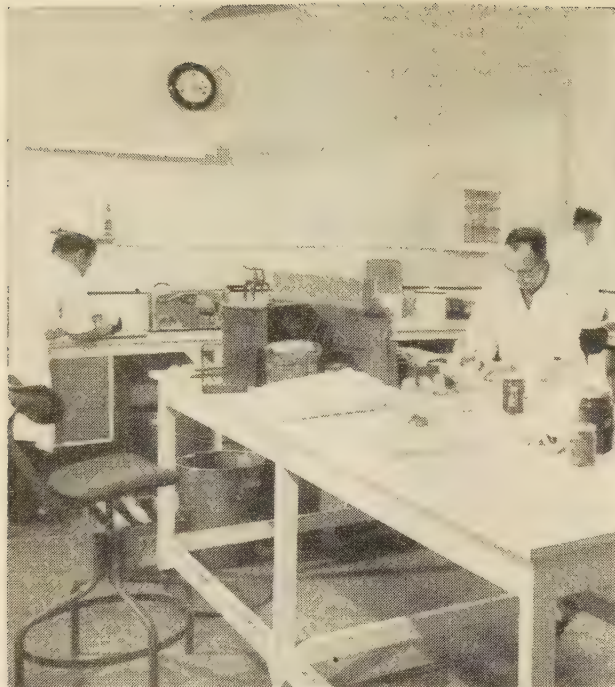
A flood gate can be fitted to the end of a concrete or steel pipe, and as long as provision is made to prevent erosion by the water on the discharge side a fairly simply constructed outlet is quite satisfactory. If a gate is fitted to a culvert, it is important to provide some support along the length of pipes to prevent them moving out of

function is to prevent large quantities of outside water from entering an interior drainage system.

Driftwood or other material lodging in a flood gate may prevent it from closing and have serious results, as a gate jammed 3 to 4 in. open will be completely ineffective. A screen or strainer should be fitted on the inside end of the pipe to the flood gate, as most blockages occur from material that is carried through the gate with the drainage flow. A flood gate fitted with a debris screen should require little attention apart from an occasional inspection and cleaning of the screen.

ROUND THE RESEARCH STATIONS

Current Work and Findings in Department of Agriculture Trials and Experiments



Wallaceville

Diagnosis of Cobalt Deficiency in Sheep

The best way of diagnosing cobalt deficiency, as previously pointed out in "Journal" articles, is by a trial on the farm with two groups of animals, one of which receives no special treatment and the other receives cobalt. Cobalt bullets are useful for this purpose. If both groups are weighed at the beginning and the end of the trial, an average weight change difference of about 5 lb in favour of the cobalt group is usually indicative of cobalt deficiency.

However, it is not always convenient or practicable to run trials on the farm, and laboratory examinations of livers from suspected deficient animals are carried out at Wallaceville Animal Research Station to assist diagnosis. Formerly livers were analysed for cobalt content, but it has been found that cobalt is active in the form of vitamin B₁₂, to which it is converted in the paunch, and that cobalt deficiency is, in effect, a deficiency of vitamin B₁₂.

On the basis of this information Wallaceville trials have shown that the vitamin B₁₂ content of liver gives a better indication of the presence or absence of cobalt deficiency than does the cobalt content. Provisional vitamin B₁₂ diagnostic criteria for fresh liver have been worked out and are as follows:

Very low: Less than 0.07 parts per million B₁₂.

Low: From 0.07 to 0.10 parts per million B₁₂.

Borderline: From 0.11 to 0.19 parts per million B₁₂.

Normal: More than 0.19 parts per million B₁₂.

Wallaceville

Escherichia coli Septicaemia in Lambs

An *Escherichia coli* septicaemia has been found to be responsible for the sudden deaths of about 100 lambs from a flock of 1,400 in the South Island and for a number of lamb deaths in other flocks.

The affected lambs were three to eight weeks old and had been docked, and though they were observed twice daily by the farmer, they were almost invariably found dead at the rate of three or four a day without any premonitory signs.

Deaths were at first thought to be due to enterotoxaemia, but administration of enterotoxaemia antiserum failed to check losses.

The most characteristic finding on post-mortem examination was the presence of large amounts of straw-coloured fluid and fibrin strands in the thoracic cavity, with fibrin in the abdominal cavity. Other evidence of septicaemia, such as small hemorrhages throughout the carcass, was usually lacking. Some lambs showed all the features of enterotoxaemia, while in others there were no significant changes.

Some lambs survived the initial septicaemia, and infection localised in the central nervous system, leading to meningitis and symptoms of a central nervous disorder, and in the joints, leading to arthritis and severe lameness.

E. coli has been regularly isolated in pure culture from all organs, ribs, and arthritic joint fluid of affected lambs.

In transmission experiments lambs were readily infected by intravenous inoculation of thoracic fluid from affected lambs or a pure broth culture of *E. coli*,

and died in seven to 23 hours. Post-mortem findings were similar to the most characteristic field cases and *E. coli* was recovered from all organs and ribs.

Rukuhia

Method of Cutting Pasture for Silage

The normal practice in silage making is to close a field as it becomes surplus to requirements and when the pasture has attained silage stage, commonly 15 in. to 18 in. high, it is cut with the mower. Pasture research suggests that the mower normally cuts closer to the ground than is desirable and that a succession of cuts when the pasture is at an optimum stage might yield more material of better quality than if one cut is taken at the normal silage stage.

With the advent of the forage harvester it is possible, if it is shown to be worth while, to modify general practice by cutting higher above the ground and by taking several cuts, say, when the pasture reaches 6 in. to 8 in. high.

To get more precise information on these particular aspects of silage making a preliminary trial was carried out at Rukuhia Soil Research Station last spring in which the effect of cutting at two heights (1 to 1½ in. and 3 in.) above the ground and of cutting at various stages of growth was studied. Yield records from the variously treated swards are being continued to assess the effect of the cutting methods on subsequent pasture growth.

Results cannot be evaluated until this latter phase of the trial is completed, but the data so far obtained are of sufficient interest to justify a larger trial which is being planned for next spring.

Wallaceville

Iodine and Goitre in Lambs

A method of preventing goitre in new-born lambs by giving ewes doses of iodine during the last two months before

lambling has been described in "Care of Livestock" notes in June issues of "The Journal". Support for this practice comes from studies using radioactive iodine which have shown that the amount of iodine accumulated by the thyroid gland of the developing foetus increases sharply at the beginning of the fourth month of pregnancy and remains at a high level throughout the fourth and fifth months until the lamb is born.

Some preliminary work suggests that injections of a poppyseed oil compound containing 40 per cent of iodine given once only two months before lambling may also be effective in preventing goitre, but more trials are required before this practice can be recommended.

Wallaceville

Avian Encephalomyelitis

A number of cases of avian encephalomyelitis ("epidemic tremor") have been reported this year, all involving White Leghorn-Australorp cross chickens. The disease has not been seen in purebred chickens.

This is a virus disease and, as the name suggests, it produces nervous signs. In a proportion of affected chickens there is a very fine tremor which may not be seen but is readily felt if the chicken is held in the hand. Some chicks will nod their heads and become staggy and weak in the legs. They rapidly decline until they cannot walk and death results from their inability to feed.



An experimental case of avian encephalomyelitis, showing a bird's inability to rise.

The numbers affected have varied from 5 to 40 per cent and losses have sometimes been confined to certain hatches. This virus is egg borne and the disease cannot be diagnosed with certainty without microscopic examination of the brain or transmission tests. It has been intensively investigated overseas and a summary of these results will be published later.

Wallaceville

Cobalt Deficiency on Kaitoke Farm

Recent research has shown that cobalt deficiency sufficiently severe to cause death can occur in ewes and lambs at Wallaceville's Kaitoke farm. The importance of this finding is that the farm consists mainly of two soil types, Kopua silt loam and Dannevirke silt loam, which together cover more than 100,000 acres and occur mainly in the Wairarapa district.

While it cannot be said that all farms on these soil types are necessarily cobalt deficient, this disease must be considered as a possible cause of unthriftiness, particularly in lambs, on farms located on Kopua and Dannevirke silt loam soils and on similar soils elsewhere.



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SHELL Weedkiller "D"—2,4-D Amine

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SHELL Weedkiller "E"—2,4-D Ester (LV)

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SHELL Weedkiller "L"—2,4-DB Sodium

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Pruning Granny Smith Apple Trees

GRANNY SMITH apple trees require different pruning treatment from any other variety of apple to avoid stagnation of growth and unproductive wood on the tree. A method of pruning which produces heavy crops of fruit, well balanced trees, and consistent growth is described in this article by R. VINEY, Horticultural Instructor, Department of Agriculture, Auckland.

THOUGH Granny Smith trees generally make strong growth when young, it has been the experience in New Zealand that when they begin bearing, growth becomes weak and the trees soon stagnate. This is particularly noticeable with trees on the commonly used Northern Spy rootstock. There has been less trouble with trees on the stronger growing Malling XII and XVI stocks.

Trees on the Malling stocks do not come into bearing as early as those on Northern Spy stock, but special treatment by way of pruning and notching to form fruiting arms and wood will encourage earlier and heavier fruiting. Stagnation of Granny Smith trees may be caused by poor drainage, damage to the rooting system by cultivating implements, and other causes, but in many instances it is due to the method of pruning.

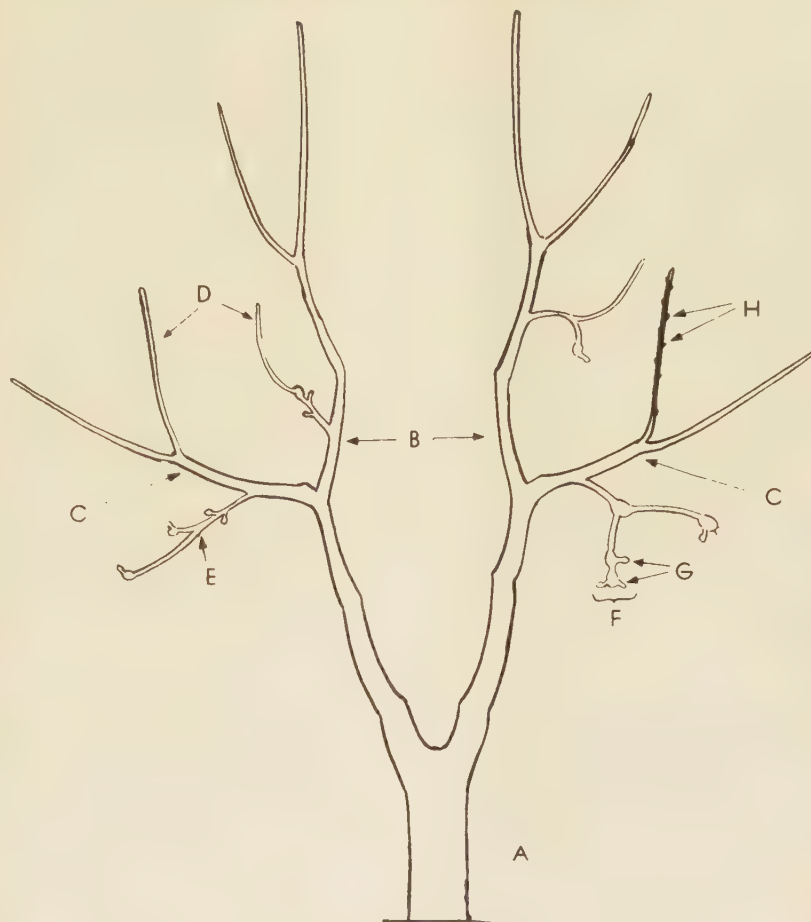
Most varieties of apples will respond to hard pruning and, if cut well back, will refurbish themselves with good growth. However, once a mature Granny Smith tree has stagnated it will respond to hard pruning only in exceptional instances; it is better to leave it **unpruned**, as reduction in the size of the tree as a result of hard pruning will only reduce cropping capacity and have no effect on growth response. Even though a tree has stagnated, it will usually continue to produce good crops of marketable fruit.

Growth Habit

The Granny Smith produces very upright growth and it is often difficult to produce horizontal growth from leading shoots when required. Usually only the first two or three buds below pruning cuts will produce lateral growth and the remaining buds go "blind".

Long pruning of leaders and lateral growths generally results in large areas of bare wood and hard pruning in later years will not refurbish this barren wood.

Definition of Tree Parts



Before pruning is begun it is essential that the main parts of the tree are easily recognised as follows:

A—Trunk	C—Fruiting arms	E—Fruit twigs	G—Fruit buds
B—Leaders	D—Laterals	F—Fruit spurs	H—Leaf buds

Fruiting Habit

Fruit bud formation on a Granny Smith is different in some respects from that of other varieties.

One year old laterals left unpruned will usually produce a proportion of fruit buds the following season, including the terminal bud. After carrying a crop of fruit most of these buds go "blind" and the terminal bud, provided it has been a fruit bud in the previous season, will form a bulbous type of spur. This spur then produces one or more fruit buds in following seasons and future fruiting is mainly confined to these spurs.

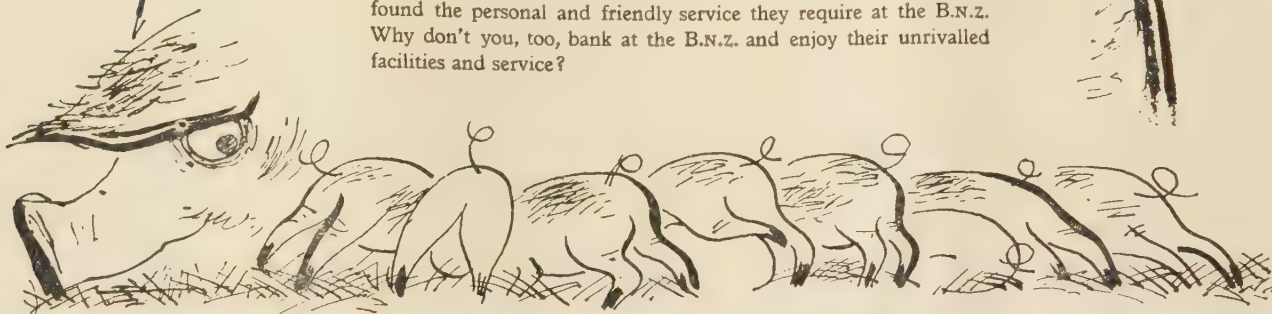
Short laterals with fruit buds on the terminals form the best fruiting wood for this variety, as spurs will eventually be formed on the terminal buds of each shoot.

As the Granny Smith is self-thinning, overcropping of the tree is not a hazard and an excess of fruit buds appears to have no detrimental effect on the tree.

Most fruit buds, even on a stagnated tree, appear to have sufficient vigour to produce good fruit, probably because of the self-thinning nature of the variety.

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Tree Parts

The leaders form the framework of the tree and carry the fruiting arms, on which are carried most of the laterals that eventually develop into fruiting wood.

Permanent parts of the tree: Trunk, leaders, and fruiting arms (see diagram on page 479).

Temporary parts of the tree: Laterals, fruit twigs, fruit spurs, fruit buds, and leaf buds (see diagram on page 479).

Pruning

For the first five or six years the primary object of pruning should be to produce a sturdy framework. During those early years fruiting should be allowed only to an extent that does not interfere with necessary growth.

After the tree has been planted, three or four well spaced, upright, sturdy shoots should be selected as the start of the future framework and all other growths cut away as shown at right. The selected shoots, or "leaders" as they then become, should then be shortened to about a quarter of their length. The pruning should be to



A good type of fruiting arm. Note the second fruiting arm (A) being developed above the lower one.

suitable side buds so that the following season two healthy, well placed shoots should arise from each leader.



At the second winter pruning about five of the best placed and strongest leaders should be shortened to about a third of their new growth and pruned to outside buds to increase the spread of the tree (see diagram at left).

The remaining shoots should be cut out.

If the tree has made good growth, a start may be made at the third winter pruning to form the fruiting arms. When the strongest and best placed



shoots for the leaders have been selected all other competing shoots should be cut right back and only a few of the lighter twigs on the older wood left as laterals.

To secure a well placed fruiting arm, a bud about 4 ft above ground level (A in diagram at left) is selected on the outside of each leader, which is then pruned back to the first bud above (B) on the inside of the shoots. The



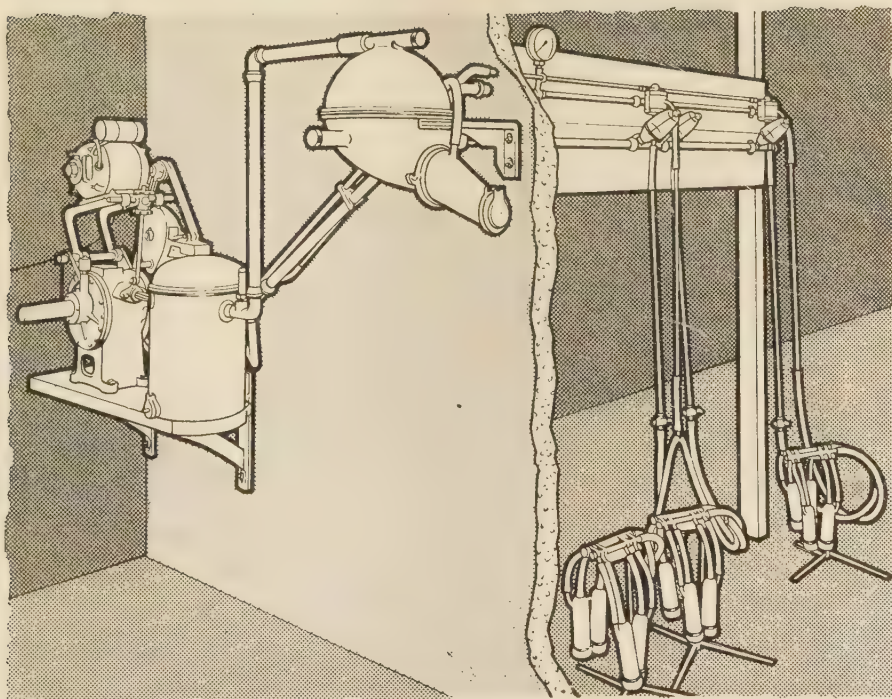
Conversion of leader to fruiting arm at maximum height desired.

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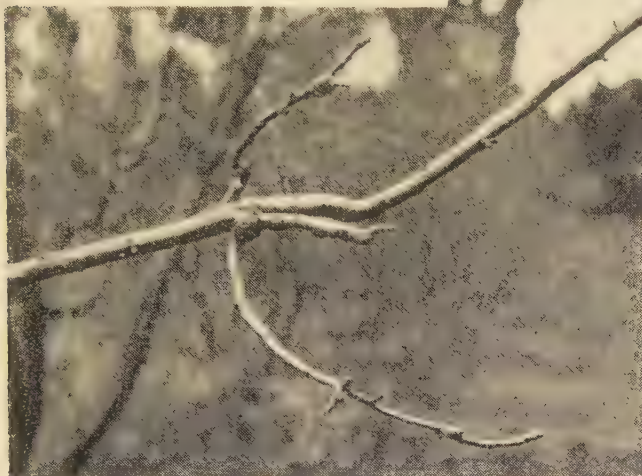
effect of this pruning should be to give a strong, erect leader and a slightly weaker shoot growing at an angle from the selected bud on the outside of the leader; this shoot is to form the fruiting arm.

A common mistake in training a tree is to have too many leaders with too great a spread, with the result that they tend to be weak and spindly and unable to support the weight of the crop.

PRUNING GRANNY SMITH APPLE TREES



Terminating a fruiting arm. Note growing point maintained by shortening a vertical lateral (A). This fruiting arm is weak and poorly furnished owing to long pruning.



Five strong leaders are sufficient to provide a sturdy framework on which to develop fruiting arms.

Development of Leaders

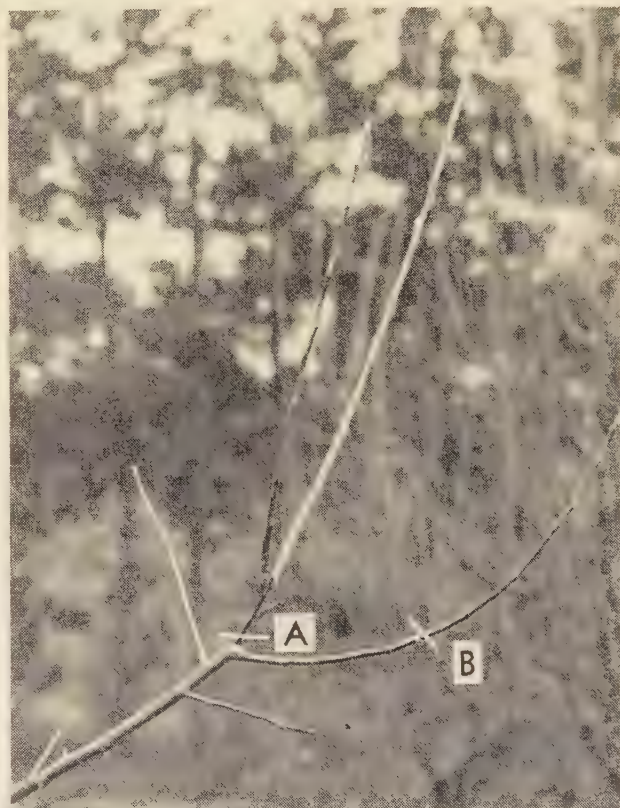
Leaders should always be pruned hard to build up a strong framework

which will support the weight of fruit carried on the fruiting arms without propping.

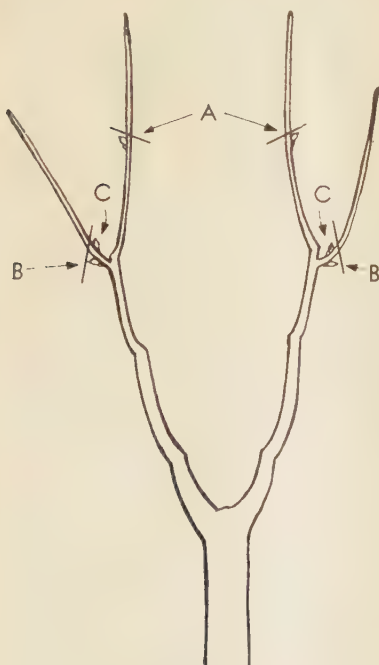
The extension of the leaders is maintained by cutting to buds, either inside or outside buds, which will keep the leaders trained vertically (A in diagram at left).

When the leaders have reached the maximum height required they should be terminated with a fruiting arm. For instance, if a leader is 12 ft high and this is the desired maximum height of the tree, the first permanent fruiting arm should be about 4 ft above the ground, and the third (about 12 ft above ground level) would terminate the leader.

When the leaders have reached their

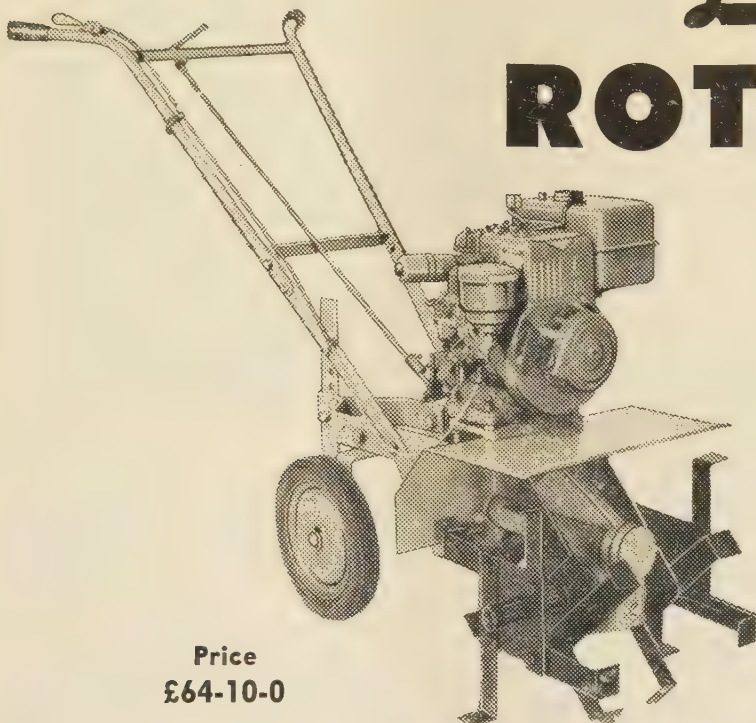


Development of a lateral which was left unpruned in the previous season. For development of a fruiting arm the vertical growth (A) should be pruned off and the horizontal lateral on right (B) shortened as shown.



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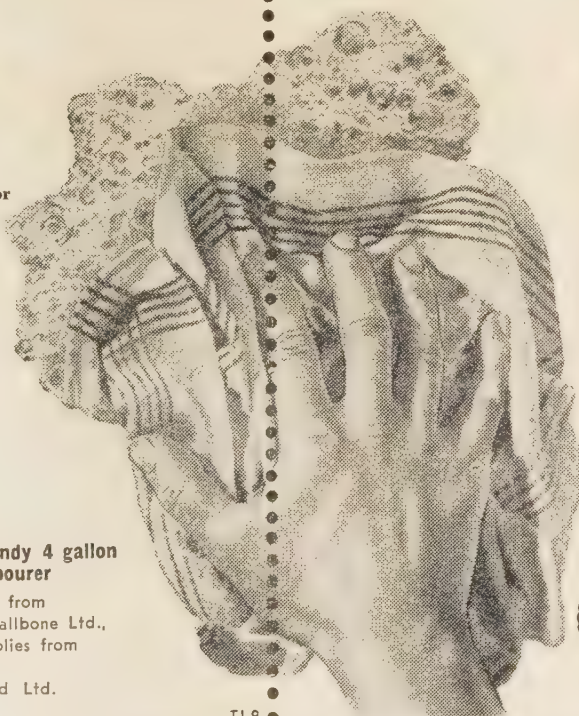
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maximum height all upright growth arising from them and from the terminating fruiting arms should be **entirely removed**, as only horizontal growth is required from then on.

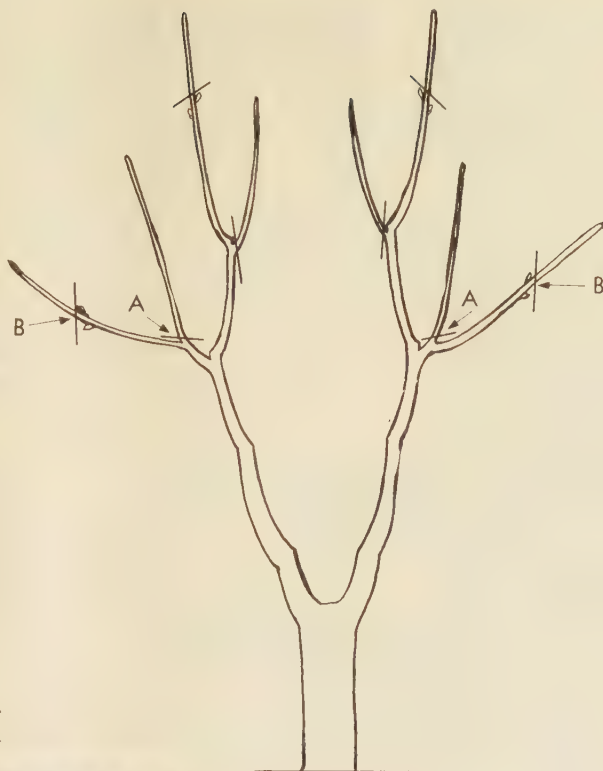
Development of Fruiting Arms

The lateral selected for conversion to a fruiting arm should be **cut hard back**, leaving only 3 to 4 in. of growth next to the leader.

In the first pruning an outside bud on this lateral, facing directly outward from the leader, should be selected (B in diagram on page 483) and the lateral pruned to the **next bud** (C in the same diagram) above the selected one.

In the second year the vertical growth

PRUNING GRANNY SMITH APPLE TREES



same manner each year until the desired maximum length is reached. The fruiting arm may eventually be terminated by cutting to a horizontal lateral which is left **unpruned** to develop fruit buds.

In addition to the growing point which extends the length of the fruiting arm, it is advisable to **maintain a growing point** between half to three-quarters of the length of the fruiting arm (after it is about five years old) to avoid stagnation.

Any vertical growth directly off the fruiting arm may be selected for this growing point and should be cut hard back in the first pruning (B in illustration at bottom of page 487). In the second pruning it may be removed or cut to a horizontal lateral which is left unpruned to provide fruiting wood. Another growth should then be selected for shortening back to provide the growing point.

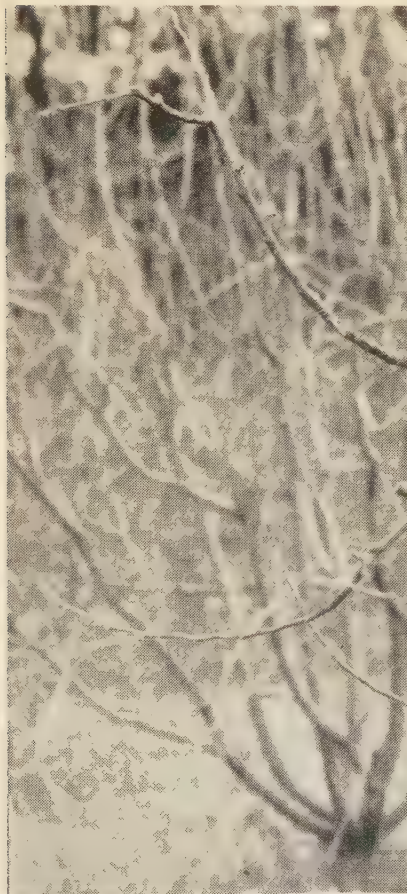
Pruning of fruiting arms should always be hard enough to promote sufficient strength to avoid propping when the tree is carrying a maximum crop of fruit.

On very strong growing trees the lateral selected for a fruiting arm may after the first year's pruning be left unpruned for **one year only** provided it is growing at a sufficient angle. After the lateral has been left unpruned for one year, the extension from the terminal bud should be shortened hard back to a bud above the one desired to continue the fruiting arm, and all vertical shoots should be removed,

arising from the first bud (immediately below the previous pruning cut) is removed (A in diagram above) and the growth from the second bud is shortened to about two-thirds of its length in the same way as for the preceding season (B in diagram).

The development of the fruiting arm from then on is continued in the

Terminating a fruiting arm. All horizontal laterals have been left unpruned for fruiting wood.



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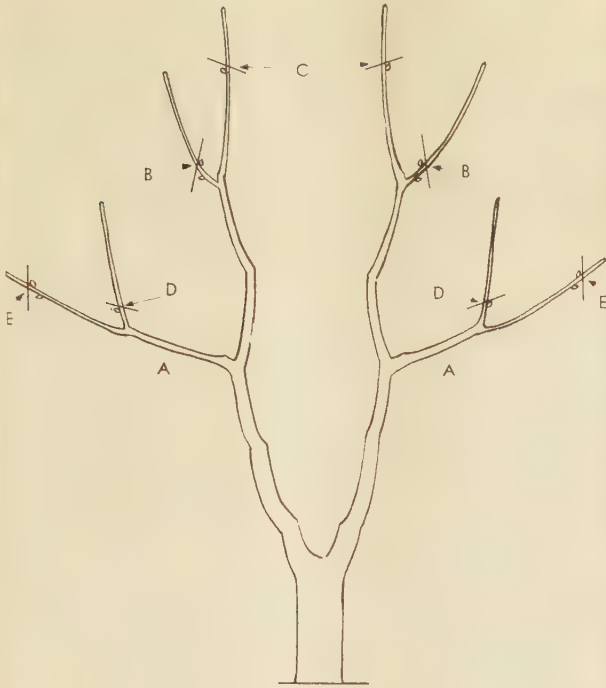
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Development of Tree



A—First permanent fruiting arm. B—Start of second permanent fruiting arm. C—Extension of leaders. D—Second growing point on fruiting arms. E—Extension of fruiting arms.

leaving only horizontal laterals for fruiting wood.

When a fruiting arm is being developed, duplication of the growing points for extension should always be avoided and there should only be two growing points (maintained by shortening back) on any individual arm, one for extension and the other to provide a growing point to encourage the flow of sap along the fruiting arm.

All vertical shoots with the exception of the two required for growing points should be pruned off close to the fruiting arm.

Change to Suggested Method of Pruning

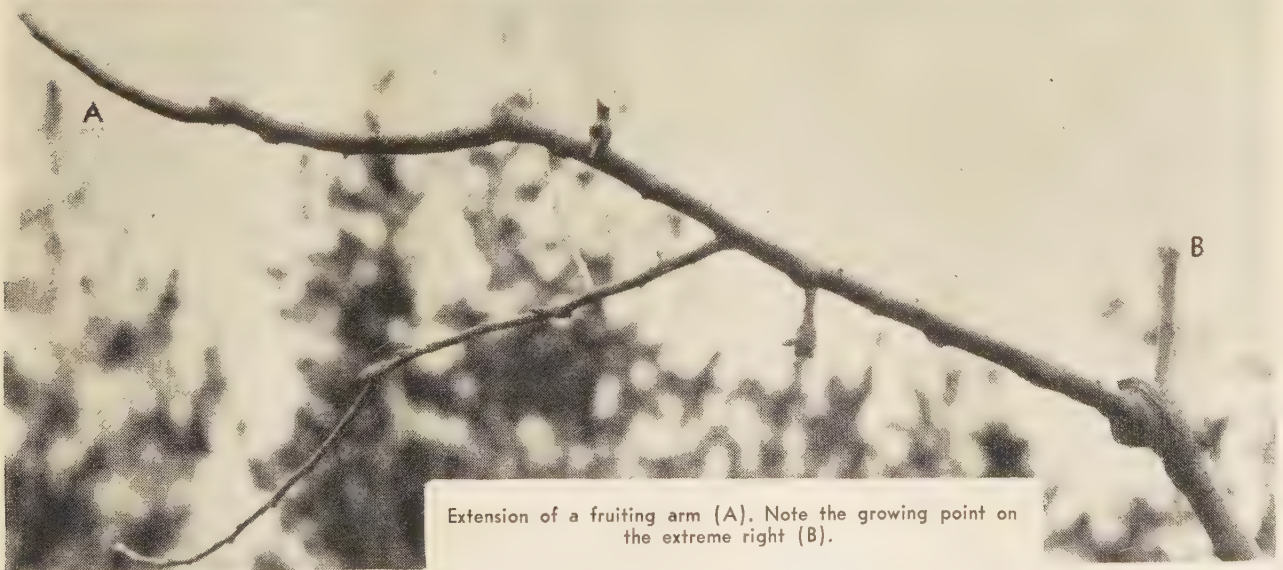
In some districts very few mature trees have been developed by this

system of pruning and some growers may wish to change to this more desirable method. Trees which are showing no signs of stagnation will respond to the changeover in method of pruning.

On mature trees the introduction of the new system should be spread over three years to avoid excessive growth and too great a reduction in crop.

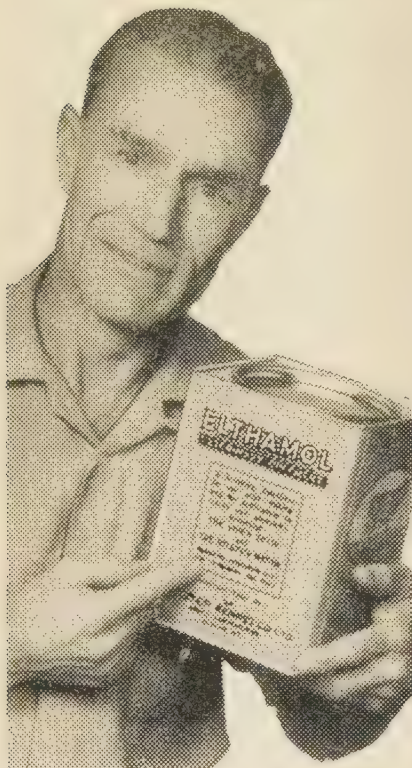


The result (A) of cutting to the bud above the one required for horizontal development (B).



Extension of a fruiting arm (A). Note the growing point on the extreme right (B).

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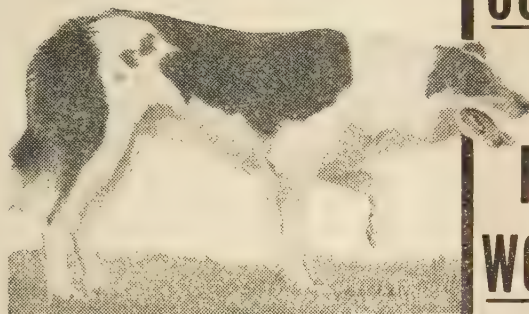
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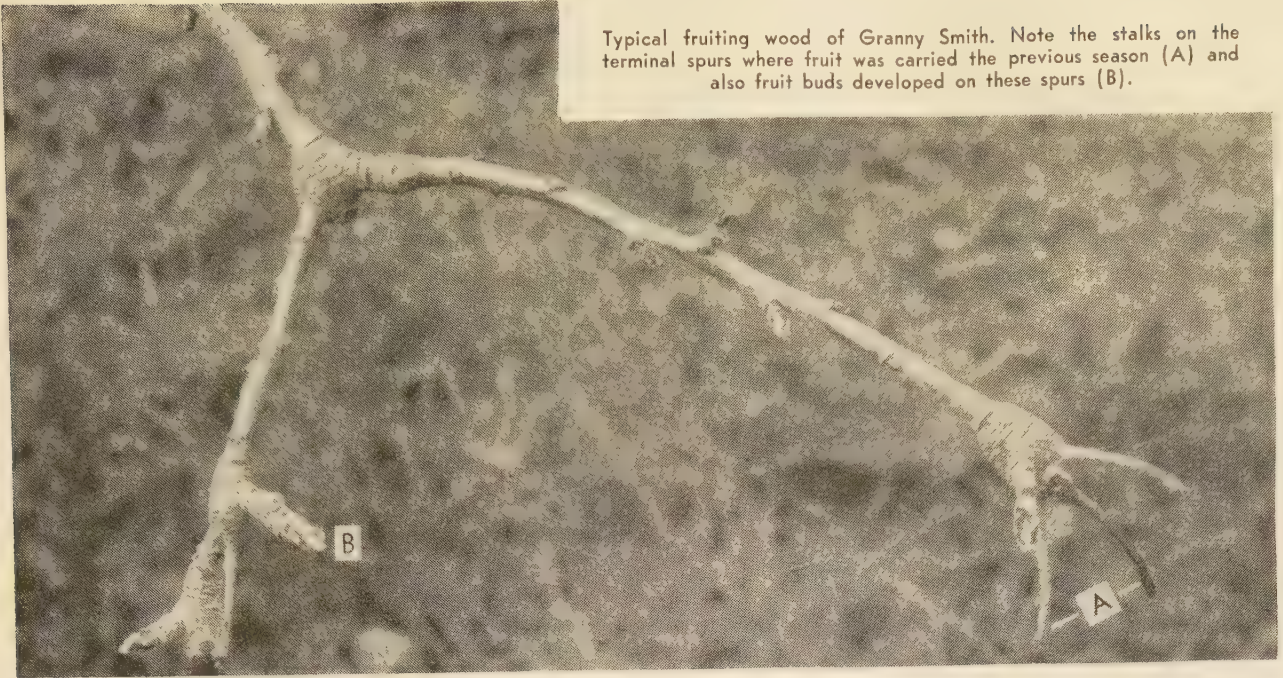
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PRUNING GRANNY SMITH APPLE TREES

Typical fruiting wood of Granny Smith. Note the stalks on the terminal spurs where fruit was carried the previous season (A) and also fruit buds developed on these spurs (B).



Redpoll Damage in Central Otago Orchards

ATTRACTING the birds away from orchards by feeding them seed cleanings is suggested as a means of reducing damage to fruit by redpolls in Central Otago orchards. The proposal is put forward by D. Stenhouse, Canterbury Agricultural College, in Canterbury Chamber of Commerce Bulletin No. 366 "The Redpoll and New Zealand Agriculture", copies of which are available from the Secretary, Canterbury Chamber of Commerce, P.O. Box 187, Christchurch.

Redpoll flocks come into orchards in Central Otago for about six weeks in spring (from early September) in search of food, mainly seeds on the bare, cultivated soil. However, the birds also fly up into the trees, where they peck holes in fruit buds. Mr Stenhouse says evidence to date suggests that negligible damage is done in grassed orchards because in them very little food is available at the time flocks invade orchards.

As preventive measures shooting, poisoning, and bird scarers are unsatisfactory. He therefore suggests the feeding of seed offal away from orchard areas, though he has not determined how much would be required or how far away from orchards it would need to be.

In the first year from four to six well spaced and strong leaders should be selected and all others in excess of this number should be entirely removed. Any fruiting arms which have become too vertical should be pruned to a horizontal branch.

The **permanent** fruiting arms should be selected and the remainder, which are only **temporary** fruiting arms, should be retained for fruiting only and therefore cut to horizontal laterals which are left **unpruned**.

The **permanent** fruiting arms **only** should be pruned as described previously for the development of fruiting arms.

In the second year at least 50 per cent of the **temporary** fruiting arms should be removed by cutting as close to the leaders as possible. The permanent fruiting arms and the remaining temporary ones should be pruned as in the previous year. All vertical growths, unless required for a growing point or the start of a new permanent fruiting arm, should be pruned off. Never shorten a lateral unless it is required for development; if not required, it should be cut out or left unpruned for fruiting.

In the third year the remaining **temporary** fruiting arms should be removed and as much fruiting wood as possible should be left on the permanent ones. By this time the tree should be converted to permanent leaders and fruiting arms only, and pruning should be carried out as previously described for mature trees.

Notching

Experiments carried out in Auckland proved that notching above the buds

on leaders and/or fruiting arms of strong growing trees produced growth on wood which otherwise would have been barren and unfurnished.

To obtain the best results notching should be carried out about the end of September or in early October. Notching is done with a hacksaw blade by cutting through the bark, just into the wood, above all outside buds where it is desired to obtain lateral growth for the development of fruiting arms and/or wood.

Treatment of Pruning Wounds

All pruning cuts and wounds more than $\frac{1}{2}$ in. in diameter should be treated to prevent the entry of fungous disease. The edges of the wound should first be trimmed with a sharp knife to remove all rough bark and then painted with a solution of corrosive sublimate made up as follows:

Dissolve 1 gramme of mercuric chloride in 15 cc of concentrated hydrochloric acid and add the mixture to 1,000 cc of water.

This material is corrosive to metals and a deadly poison. It should be stored in a glass-stoppered jar labelled POISON: NOT TO BE TAKEN.

After this solution has dried on the wound the whole area should be sealed with a bituminous paint or a heavy grade of petrolatum. This treatment is particularly important in areas such as Auckland where European canker (*Nectria galligena*) is troublesome.

Photographs by Sparrow.

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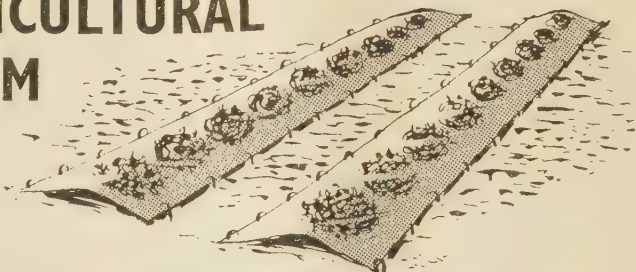
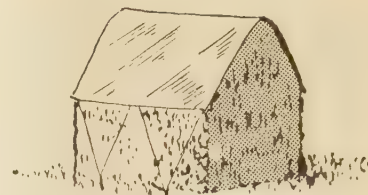
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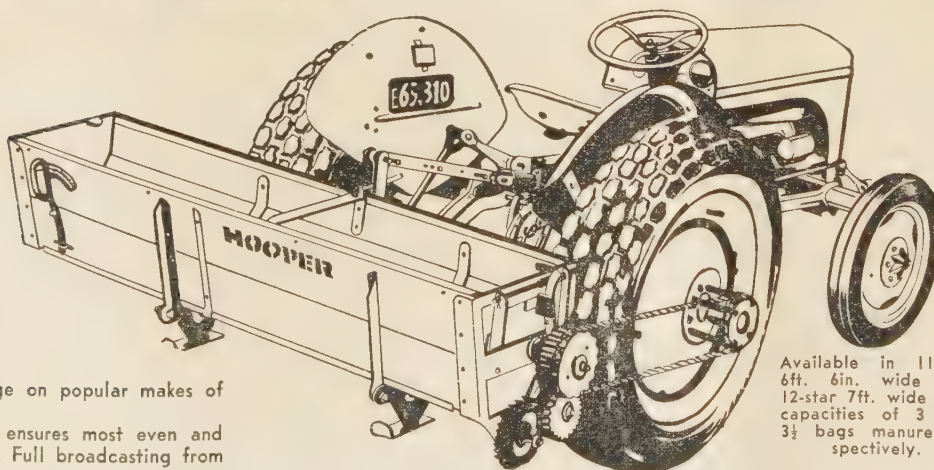
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Potassium Losses in Pasture

IN manuring of pastures one topdressing of superphosphate and/or potassium chloride (muriate of potash) is normally relied on to fulfil requirements over a whole year. It is assumed that the pasture will not deplete supplies through luxury consumption in the months immediately after topdressing and that the application will remain in a position and form available for uptake. To investigate whether these assumptions were justified as far as potassium was concerned experiments have been carried out by Rukuhia Soil Research Station with the yellow-brown loam group of soils, which have been developed from volcanic ash in Taranaki, the Waikato, Bay of Plenty, and parts of Hawke's Bay. The results of these experiments and the conclusions drawn from them are discussed below.

LUXURY CONSUMPTION

THAT plants are prone to luxury consumption was illustrated by ryegrass on Horotiu sandy loam. Topdressed with 2 cwt of potassium chloride in September 1957, in November it contained 4.7 per cent potassium. The grass was cut whenever it reached the silage stage and completely removed. The potassium level dropped until in January 1959 it was down to 1 per cent. A level of 2 per cent is consistent with optimum growth. This was drastic treatment, but the trial serves to show that pasture shortly after topdressing takes up much more potassium than is required. The ceiling level approaches 6 per cent. This is but one example of many that could be quoted.

The top 3 in. of soils from a Taranaki trial where plots had in two years received up to 16 cwt of potassium chloride was examined. The potassium status of the 16 cwt plots was little superior to that of the control. The plots had been grazed in common with the very much larger field in which they were situated.

It is quite possible that cows grazing the treated area would have moved off and urinated elsewhere. Since potassium is mainly excreted in urine, this could account for some loss, possibly half the application. It is concluded that the remainder was carried down in the soil in drainage, for yellow-brown loams have little power of "fixing" potassium.

Potassium consumed in pasture is returned to the field in urine, but is concentrated on a much smaller area. Volumes of urine excreted, the potassium content, and the area of soil covered have been studied by the staff of Rukuhia on herds at Ruakura Animal Research Station. It seems that over a year potassium from 1 acre is returned to about one-sixth of the area and in a concentration variable but on the average equivalent to some 14 cwt of potassium chloride per acre. The remaining five-sixths would receive a much less return.

EFFECT OF URINATION

TO study whether the effect of urination, even in the favoured area, would persist for more than a year, a pot experiment was conducted in a glasshouse with Inglewood coarse sandy loam, a Taranaki yellow-brown loam. The top 3½ in. and 3½ to 7 in. layers were collected separately, sieved, and packed into the pots, a thin layer of white quartz sand serving to separate them. Treatments were

(1) control, (2) urine (at a rate calculated from observations), (3) potassium chloride, and (4) potassium chloride with urea, all with and without lime, the potassium and nitrogen in treatments (3) and (4) being at the same rate as that supplied in the urine. Each treatment was replicated five times. White clover and ryegrass were planted in each treatment, all plants being derived, for uniformity, from a single white clover and a single ryegrass plant. They were successfully grown in the control and potassium chloride treatments from the start, but could not be established in the pots receiving urine or urea for 10 weeks. It is considered that a release of ammonia checked development of new roots. The pots were watered to simulate a 100 in. rainfall.

All drainage was collected and accumulations were analysed periodically. Likewise over the year during which the trial was run seven cuts of herbage were taken and analysed (five cuts where establishment was late). In the final herbage yield roots washed free of soil were included. Potassium was determined in the soil, topsoil and subsoil separately, at the start and in each pot at the conclusion of the trial, boiling dilute nitric acid being used to extract it. The difference between the two figures was taken to indicate residual potassium from the treatment.

In Table 1 are shown the percentage recoveries of potassium applied as urine, potassium chloride, and potassium chloride with urea.

TABLE 1—PERCENTAGE POTASSIUM RECOVERIES

Treatment	In herbage	In drainage	In soil	Total
Urine	56.8	30.1	6.6	93.5
Potassium Chl.	54.7	25.6	7.5	87.8
Potassium Chl. + urea	49.9	31.5	6.9	88.3
Urine + lime	67.5	28.6	-0.1	96.0
Potassium Chl. + lime	60.0	22.1	5.6	87.7
Potassium Chl. + urea	55.0	32.2	1.4	88.6
Mean	57.3	28.3	4.7	90.3

RESULTS show that in the year, despite the amounts involved, comparatively little potassium added as urine or its equivalent remained in the soil, the bulk being taken up by the herbage and the balance moving down in the drainage. Glasshouse conditions are rather different from those in the field. Temperatures are higher, evaporation greater, and drainage less, factors which would tend to reduce downward movement of potassium.

In the control pots rather more potassium appeared in the drainage and herbage than was apparently removed from the soil. This indicates that over the year the plants have used some potassium other than that extractable by the nitric acid. Since this will have occurred to some extent in other treatments also, the calculated recoveries will not be quite as high as shown. Some potassium is unaccounted for. The very vigorous washing to separate roots from soil no doubt led to some loss.

An interesting point was noted in the first drainage collection. As no plants established in the urine- and urea-treated pots for the first 10 weeks, there was no

RECENT RESEARCH WORK

potassium uptake by plants or the taking up and transpiration of moisture. The amount of drainage was twice as great. These two factors—no plant uptake and increased drainage—would both favour greater loss of potassium from the pots. Actually the potassium loss was half that in the treatment with potassium chloride alone. Some factor in the urine and urea treatments (probably the ammonium produced) favoured potassium retention.

A further point of interest is that the lime treatment (2 tons per acre) on this Taranaki soil gave an average response of 17 per cent. Benefit from heavy liming had previously been noted in a pot experiment with a Taranaki yellow-brown loam. These soils, however, on evidence of observational

field trials, have not been regarded as lime responsive.

Conclusions are:

1. Plants tend to luxury consumption of potassium when excess is available.
2. In yellow-brown loams potassium above immediate plant requirements is liable to move down in drainage.
3. Once deficiency levels of potassium have developed, these soils are likely to require annual applications of potassium salts. Split applications over the year would appear preferable.

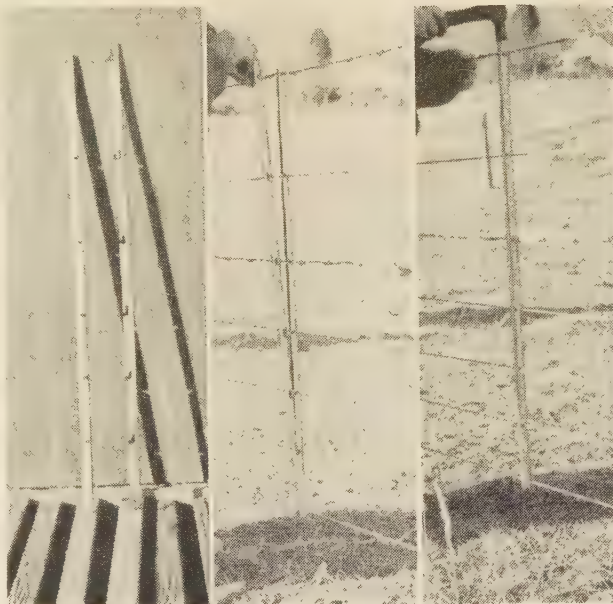
—E. B. DAVIES, *Senior Principal Scientific Officer*, and D. E. HOGG, *Senior Scientific Officer*, Department of Agriculture Rukuhia Soil Research Station, Hamilton

New Type of Fence Batten

THE present interest in fencing and the need to reduce costs decided a South Canterbury farmer, Mr J. H. Collins, to design and produce his own batten. The result is shown in the illustrations at right, and has proved most satisfactory, giving a neat and stable fence.

Consisting of two pieces of straight steel, the batten has no added catches or clips and is secured solely by its design. It could be made in a good farm workshop or by a blacksmith or engineering shop. The pattern is for a standard gauge seven-wire fence.

The batten is made from a piece of 1/16 in. sheet metal measuring 3 ft 1 1/4 in. x 1 1/2 in. This is punched as illustrated and then folded to a U shape sufficiently wide to accept the centre piece. The centre piece supplies the reinforcing and is made from 3/16 in. sheet metal measuring 3 ft 1 1/2 in. x 8/10 in. The top and bottom wires are braced by the long V grooves at the ends of the centre piece and hold the assembly rigid. The other wires can be strained through the batten.



Left: The batten and the centre piece, showing the shape of the cuts in the metal. Middle: The centre piece being placed in position and, right, being hammered into place.

Assembly requires a hammer only and, at average speed, a man can put on two battens per minute. There are no rough edges to catch wool, and the strength is sufficient to stand rough treatment from stock. The cost should compare more than favourably with that of other types of batten.

—D. G. REYNOLDS,
Farm Advisory Officer,
Department of Agriculture,
Fairlie



"The Calf—Its Management, Feeding and Health":

J. H. B. Roy

THIS new edition of a handy little book on calf rearing treats the subject comprehensively. It reviews most of the modern research work on the subject and teems with information, most of which has a scientific basis.

It is designed primarily for use by farmers in Britain, where methods of calf rearing can be and are much more varied than in this country, for which, in consequence, it has a limited usefulness. For example, a large section of the volume deals with the multitude of artificial rations suitable during the various stages in the life cycle of the calf. Accordingly the techniques under this heading are of interest to those few farmers in New Zealand who aim at rearing calves without dependence on whole or separated milk. Thus, the town milk supply farmer interested in milk substitutes for economic reasons and the sheep farmer endeavouring to rear crossbred calves in the absence of a dairy herd will find much to interest them.

Though reference is made to New Zealand research and the practice of making maximum use of pasture in calf rearing, this aspect is treated with some measure of suspicion. Thus the author states: "The success of this method is hard to reconcile with the general opinion of agricultural advisers in this country [England]. It has always been believed that calves are unable to consume enough grass to furnish more than a small proportion of their requirements until they reach six months of age, and that hay and concentrates must be given in addition to grass to a younger animal. The main benefits of turning calves out to pasture at a young age were considered to be exercise, sunshine and fresh air."

This, of course, is rather a naive statement; it cannot be soundly based on the 500,000 dairy calves reared each year in New Zealand would hardly live to the yearling stage.

The book is recommended to farmers wishing to increase their general knowledge, but for information on successful methods of calf rearing in New Zealand they are referred to the Department of Agriculture Bulletin No. 228, "Good Rearing of Dairy Stock", which covers the situation in this country.

—C.P.McM.

"Farmer and Stockbreeder" Publications Ltd. 9s. 6d.

The Home Orchard in Winter

By S. FREW,

Instructor in Horticulture,
Department of Agriculture,
Christchurch

IN winter, when enthusiastic home gardeners plan the further development of their sections, frequently the establishment of a home orchard is considered. This article discusses the advantages and disadvantages of a home orchard and suggests methods for growing fruit in town sections which are usually considered too small for fruit trees. For existing home orchards advice is given on routine winter work.

THE home gardener should not attempt to grow fruit trees until he fully appreciates the work and expense needed for their establishment and maintenance.

The advantages of owning a few fruit trees and of having freshly grown fruit available are obvious and need no elaboration. In addition a well planned home orchard can provide a supply of the better-keeping types of fruit such as apples and pears for a considerable period after harvesting.

Work Required

For success in an orchard regular and thoroughly competent maintenance work is necessary at the correct time. This care of fruit trees can be most rewarding, and the home orchardist, without giving the detailed cultural attention of the commercial fruit-grower, can produce some very satisfactory crops provided he attends to the two major jobs of spraying and pruning. Any person unwilling to devote this minimum attention to his fruit trees would be well advised to restrict his gardening to less exacting crops.

Pruning and spraying demand considerable time and energy, how much depending on the number and size of trees. As a rough guide, it could be said that though the pruning of small trees takes little time, detailed pruning of larger, mature trees may take up to $\frac{1}{2}$ hour for each tree, and this has to be done in winter, when the weather is not always congenial.



The main work in the home orchard during winter is pruning, the aim being to maintain a balance between wood growth and fruit production.

Spraying takes less time per tree, but the preparation of sprays and cleaning of equipment afterward all take time, and the spraying of a few fruit trees during a weekend could easily mean two or three hours lost for other gardening work. Furthermore, spraying is a recurring job. As spray should be applied every three weeks to a month from winter or early spring until close on harvesting time, the total time spent in this work during a season is considerable.

Expenditure

The other very important factor is expense. The cost of buying trees is only the first item, though it is a most important and fairly costly one, as only the best type of tree on a known suitable rootstock should be bought from a reputable nurseryman. It is the subsequent expense, however, which is so often overlooked by the potential home orchardist. The essential work of spraying requires further initial expense for equipment, plus an annual expenditure on spraying materials.

Spraying Equipment

For fruit trees the spray apparatus must be adequate. This means that something more substantial than a syringe type of sprayer should be provided. Recommended home orchard equipment is either a bucket pump or, preferably, a knapsack sprayer. A bucket pump requires one person to work the pump and another to do the spraying, an arrangement not always possible for the small household. A knapsack sprayer, on the other hand, requires only one person. Knapsacks usually hold 3 gallons, enough for spraying fruit trees of all sizes, but if the weight is considered rather excessive, they need not be filled to capacity. The initial outlay for a knapsack sprayer is perhaps fairly high, but it should be remembered that its use need not be restricted to fruit tree spraying, and that it will be of great value in the flower and vegetable garden.

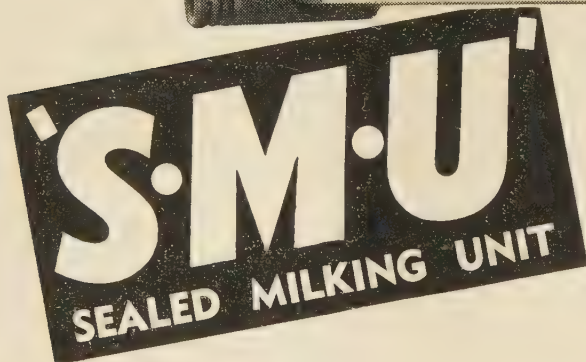
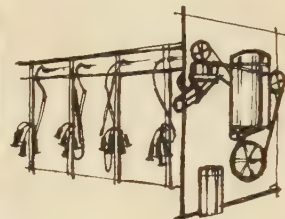
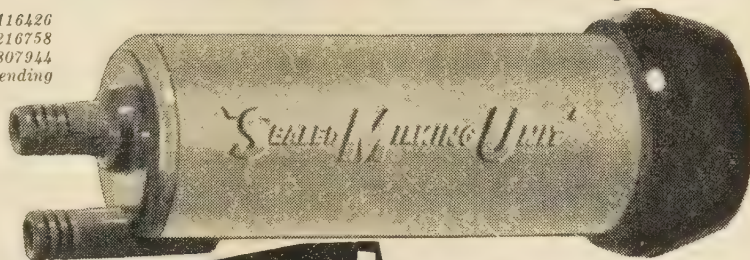
The other expenditure, for spray materials, is not a major one and can, perhaps, be ignored when the pros and cons of establishing a home orchard are assessed.

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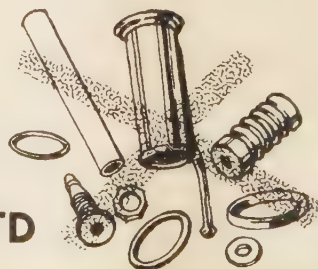
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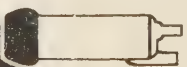
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Advantages and Disadvantages

To sum up, it might be reasonable to assume that for a small household, establishment and maintenance costs could quite easily account for a fair proportion of the alternative cost of buying fruit for the home—fruit sized and graded, of good quality, and delivered to the door in reasonably fresh condition.

For the larger household the balance could be more in favour of the home-grown fruit, as the larger the quantity grown the less it costs. Anyone with a large family would be well advised to consider the probable savings effected. The enthusiast, of course, will need no such encouragement.



The tree as received from the nursery.

Limiting Factors in Establishment

For those willing to accept the cost and time and effort required in orchard establishment the next point to consider is what to grow, and whether locality and site impose any limitations to individual preferences. Three factors determining these limitations are summarised here:

Climate

1. Cold winters are a pre-requisite for apricots, cherries, and European plums. Consequently these fruits do not do so well in the northern parts of New Zealand.

2. Mild winters are necessary for lemons and other subtropical fruits. The South Island, except for a few favoured localities, is too cold for citrus.

3. Late spring frosts damage fruit blossoms and small green fruits. Early blossoming fruits such as stone fruit, particularly apricots, should not be grown in areas susceptible to these frosts.

4. Dry autumns are desirable. Wet weather near harvesting can cause serious losses through fungous diseases.

Soil Type

1. All fruit trees require reasonably good drainage.

2. Light, sandy soils overlying shingle are very suitable for peaches and nectarines.

3. Medium to heavy land is suitable for apricots, apples, cherries, and Japanese plums.

4. Heavy clay soils with poorer drainage are tolerated by European plums, pears, and quinces.

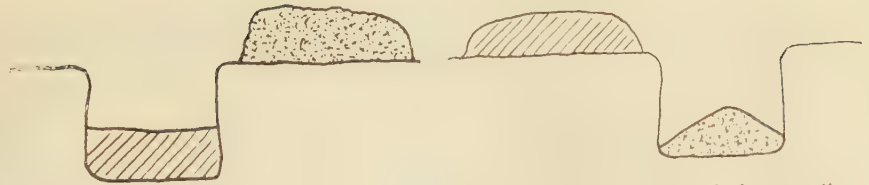
In the small home section it is not always possible to plant each kind in its best environment, but in some instances, particularly on a sloping section, conditions approaching the requirements for different classes of fruit trees can be selected.

Area Available

1. On large sections the factor of area available does not apply, and 16 to 18 ft spacings for standard trees may be possible.

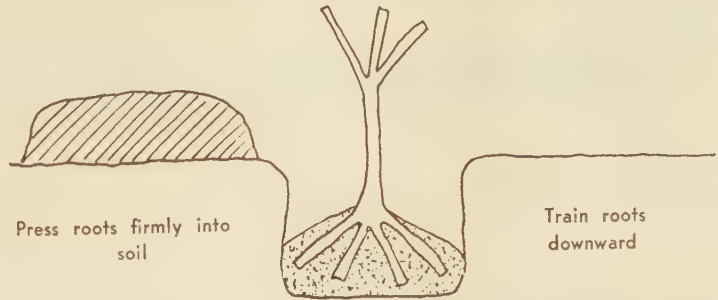
2. On smaller sections the growing of dwarf apple and pear trees provides

PLANTING A FRUIT TREE



The hole dug for the tree and the topsoil removed.

The subsoil removed and the topsoil replaced, mixed with a dusting of bonedust, and mounded ready for the tree to be planted.

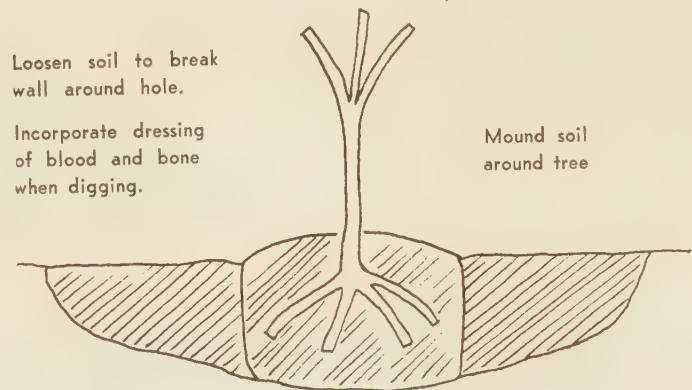


Press roots firmly into soil

Train roots downward

The tree with its roots pruned and placed in the hole. Though it is shown with its top also pruned, in practice this pruning is done after planting.

▼ The tree planted satisfactorily.



Loosen soil to break wall around hole.

Incorporate dressing of blood and bone when digging.

Mound soil around tree

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the answer to the space problem. Raised on special dwarfing stocks, these trees produce good crops of normal sized fruits, but they always remain compact, relatively small trees.

3. For the minimum sized section with no garden space available for fruit trees the cordon and espalier systems of training trees provide alternative methods of fruit production. These methods are described here.

Cordons and Espaliers

Cordons and espaliers can conveniently be grown along the edge of the vegetable garden without encroaching on the garden area, and they are excellent for dividing the lawn area from the garden, or to mask an unsightly fence or corner.

Both cordons and espaliers require support from a wire fence, with posts 5 to 6 ft high and 10 ft apart. Three wires at 2 ft spacings are usually enough for cordons, and five wires at 1 ft spacings for espaliers. In open ground fences should run north and south to ensure adequate sunshine on both sides of the row. When the espaliers or cordons are grown near walls or hedges likely to shade one side the wires should run as near east and west as possible.

The essential difference between cordons and espaliers is that cordons are grown on dwarf stocks at close planting, and espaliers are grown on normal stocks at wider spacing. Cordons are suitable only for apples at present, but where it is desired to have a number of varieties of apples in preference to just one or two, cordons have an advantage over espaliers. On the other hand, practically all classes of pip and stone fruit can be trained as espaliers.

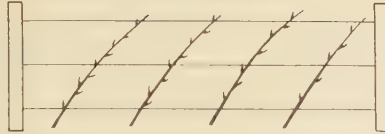
The true cordon is a single straight rod grown either erect or preferably oblique. Varieties of the simple cordon are the double U, the triple and multiple cordons, and the lattice type or Belgian fence (see diagrams).

The standard espalier comprises a central stem with horizontal arms. There are numerous variations from this standard espalier, and some designs are shown in the accompanying diagrams.

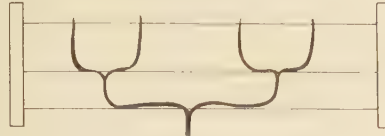
Training of Cordons

It is desirable to start cordons with one-year-old unbranched whips. For upright cordons the rods should be planted erect, and for oblique cordons they should be planted on an angle toward the way they are to be trained. Planting should be at 2 ft 6 in. spacings. The training of single-stem cordons is simple. The annual growth of the leader is not shortened until it reaches the top wire, unless the cordon is not producing enough side shoots. Pruning will encourage development of these lateral growths and also growth of the leader itself, if it has stopped growing.

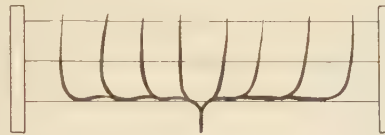
Cordons



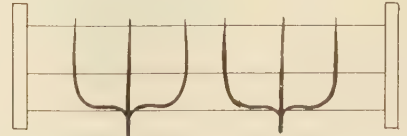
Oblique cordons



Double U cordon



Multiple cordon



Triple cordons



Belgian fence

The aim should be to develop these short laterals as fruiting wood. At winter pruning they should be treated as follows, according to the amount of growth made:

- (a) Short laterals up to 4 in. long—leave uncut.
- (b) Laterals 4 in. to 9 in. long—leave uncut the first year and

shorten back to a bud on the two-year-old wood the next winter.

- (c) Laterals longer than 9 in. can either be cut back to three or four buds, or preferably tied in a loop or tied down so that the tips are below horizontal,

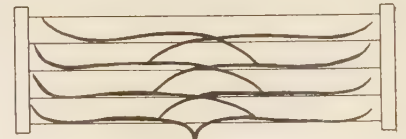
Espaliers



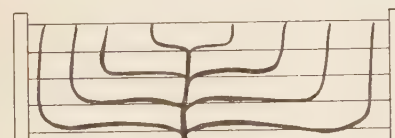
Standard espalier



U espalier



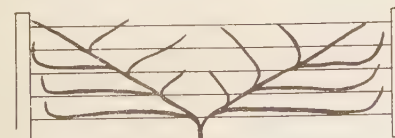
Palm-leaf espalier



Palmette espalier



Candelabrum espalier



Modified fan espalier



Fan-shaped espalier

Practically all kinds of pip and stone fruits can be trained as espaliers.

HOME ORCHARD . . .

Laterals so treated will develop fruit buds and may be shortened to about 6 in. the following winter.

- (d) Old, spent lateral wood should be removed and replaced by young shoots every few years.

The training of a cordon as a Belgian fence necessitates heading the rods in the first year to about 20 in. from ground level. The cut should be made so that the two top buds are opposite each other and facing in the direction of the wires. The subsequent growths from these two buds are trained along bamboo canes or dowelling attached to the wires at an angle of about 45 degrees. These growths receive the same treatment thereafter as simple cordons. Double U, triple and multiple cordons are headed back in the same way in the first year, and thereafter are trained on the same principle as espaliers, conforming to the designs as illustrated.

Training of Espaliers

Espaliers require constant care and attention to the following points:

1. Training should be done gradually throughout spring and summer to establish the desired shoots in the direction they are required to grow.
2. Training includes tying the current season's growth to the wire supports, as only young growth can be successfully trained. The growing terminal of the shoot, however, must be allowed temporary freedom to grow upright; otherwise vigour will be lost. Tying should be done from time to time throughout the growing season as growth extends and before the wood becomes too rigid to bend easily into place.

3. Ties should be at fairly close spacings and will need loosening each year as the girth of the limb increases.

The Standard Espalier

After planting for a standard espalier the whip, or single leader, should be shortened to about 2 in. above the lowest wire, this cut being made at a bud which has two good buds fairly close below, opposite each other, and facing in the direction of the wires. When growth starts all but the growths from the top bud and the two selected side buds should be suppressed. The shoot arising from the top bud should be tied to an upright cane fastened to the wires for the purpose. The shoots from the two lower buds should be trained in opposite directions along the bottom wire; if one is growing more strongly than the other,

the tying down of the weaker one should be delayed.

In the second winter the upright shoot should be shortened to about 2 in. above the second wire, and during the following summer the three shoots are retained as previously, the top growth being tied to the vertical support and the two side shoots trained along the second wire.

Any shoots arising from the lateral arms already established should be pinched back to 4 or 5 in. during summer and shortened back further during the following winter to three or four buds.

Treatment in the following seasons should be similar to that described until the vertical rod has reached the top wire. At that stage only two growths are allowed to develop from the vertical leader and are trained in opposite directions along the top wire.

Spurs and light fruiting laterals should comprise the fruiting wood formed along the horizontal arms. After the third year laterals up to 9 to 12 in. long need not be shortened provided they are bent over in a loop and the tops tied down. This, as already mentioned for cordons, promotes fruit bud development. Pears make strong lateral growth and this tying down of the tips of laterals is very necessary to bring them into fruit.

As this fruiting wood becomes old and exhausted, a gradual renewal system should be followed.

Other espalier designs are trained on the principles described. The home gardener should be able to devise the training for the cordon or espalier required for his particular conditions.

Peaches and nectarines are more difficult to develop with horizontal arms, and the fan-shaped espalier is recommended for these fruits.

Training as fans should not be difficult for the home gardener. The main principle to remember is that peaches and nectarines fruit only on one-year-old wood; therefore there must be a continual renewal of sufficient shoots each year to carry a crop. The general practice is to fruit the lateral one year and then shorten it back in winter to a side shoot near the base. Unless sufficient shoots are cut back each year, fruiting will be concentrated near the top of the espalier only.

Winter Work in Established Orchards

A winter oil spray should be applied to all deciduous fruit trees when the trees are completely dormant to control scale insects, woolly aphids, and red mites. Red spraying oil at a

strength of 2 pints of oil to 4 gallons of water is the standard mixture.

The main work in the home orchard during winter is pruning. Many theories and systems are advocated for pruning various types of fruit trees, but the aim in pruning is to maintain a balance between wood growth and fruit production. If trees are growing too vigorously, they will not set crops, and light pruning should be practised. If trees are weak growing, the tendency is for them to set heavy crops of small fruit and produce little new wood growth, and pruning should be more drastic.

Light pruning may mean retaining surplus wood or excessively long shoots temporarily for one season, but the result generally is to steady up growth and assist the development of fruit buds.

Heavy pruning requires old and spent branches to be removed entirely, and remaining growths to be either shortened or thinned out. This will encourage growth and restore the balance between wood growth and fruiting wood.

Any large cuts which have been made during pruning should have a sealing compound applied to prevent the entry of disease spores, and all prunings should be collected and destroyed by burning as soon as pruning is completed.

Grassland Association Officers Elected

THE annual meeting of the New Zealand Grassland Association, adjourned from Gisborne on 3 December because of the death of an executive member, Mr C. J. Hamblyn, was resumed in Wellington on 1 March, when the following officers were elected:

President, Dr P. D. Sears, Director, Grasslands Division, Department of Scientific and Industrial Research, Palmerston North; vice-president, Mr J. W. Woodcock, Director, Farm Advisory Division, Department of Agriculture, Wellington; executive members, Mr I. L. Elliott, Superintendent, Rukuhia Soil Research Station, Hamilton, Mr J. O. H. Tripp, Outram; secretary, Mrs H. Foster, Department of Agriculture, Wellington. These, with the immediate past-president, Mr C. E. Iversen, Reader in Agronomy, Canterbury Agricultural College, Lincoln, will comprise the executive committee.

Pressing Woollen Fabrics

By MAUD B. STRAIN,
Home Science Instructor,
Department of Agriculture,
Dunedin

CAREFUL pressing of each section of a garment as it is being made helps to give it a smooth professional look and pressing at frequent intervals during wear will keep it in shape and retain its original spick-and-span appearance. Woollen fabrics are perhaps the most difficult to press, but the work can be made considerably easier by the use of a few simple aids which if not readily available, are not difficult to make at home.

TODAY an ironing board is usually regarded as an essential piece of laundry equipment and most of them have a sleeve board, either attached or as an extra. These are the basic needs for good pressing, but there are a few extras, not difficult to make at home, that make pressing easier and assure a more professional result. These are a seam board, tailor's cushion, tailor's clapper, and for those who still rely on an ironing blanket on the kitchen table, a sleeve board, once it has been mastered, will greatly simplify pressing problems in making frocks and coats at home.

Sleeve Board

A sleeve board is excellent for pressing sleeves and those other small parts which will not fit over an ordinary ironing board. If you do not have a seam board, the sleeve board can also be used for pressing seams open, but thick brown paper should be slipped under the edge of the seam allowance so that no impression is left on the right side of the material. The narrow end of the sleeve board is handy for shrinking the sleeve cap.

To make a sleeve board you need a piece of board 1 in. thick by 24 in. long cut to taper in width from 6 in. at one end to 3 in. at the other and the corners and edges should be rounded off. A piece of board 5 or 6 in. wide and 1 in. thick and almost as long as the first board is needed as a base. The sleeve board is mounted on the base by fixing a block of wood 2 in. wide x 3 in. long x 4 in. thick between the two 3 to 4 in. from the wider end. All surfaces of the wood must be sandpapered smooth so that delicate fabrics will not catch on it.

Old blanket or thick soft felt glued to the board is suitable for padding, but nothing coloured should be used in case the dye comes out when something damp is being pressed. It must be firmly fixed so that it will not move or wrinkle in use.

Over the padding there should be a removable, washable cover. It can be fitted to slip over the narrow end and be tied with tapes under the wider end. Any strong white or unbleached fabric in a plain weave can be used.

A stylish suit in a discreetly coloured woollen check. →
The deep inverted pleats in the skirt and the wide belt and stand-away collar of the brief jacket give the outfit an attractively casual air.



[International Wool Secretariat]

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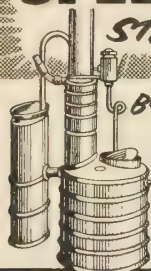


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but if it is new, it should be well washed to remove any sizing or traces of oil.

Press Cloths

A press cloth should be used even with a steam iron, at least on the right side of the fabric. Woollen materials scorch easily and a press cloth prevents scorching or shininess. Any medium-weight white or well washed unbleached cotton cloth in a plain weave is suitable and flour bags that have been opened out and washed often enough to have lost all traces of coloured printing are good. If unbleached calico or sheeting is used, it should first be washed several times to remove all traces of oiliness which will scorch and discolour the fabric being pressed and stick to the iron. When pressing woollen fabrics use a damp cotton cloth over a dry woollen one for a better finish.

Seam Board

When a seam board is used to press seams open the imprint of the seam allowance is not left on the right side of the garment as when they are pressed on a flat surface. A wooden rolling pin sawn in half lengthwise and padded and covered makes a good seam board, or one can be made from a piece of wood 18 in. long x 2½ in. wide x 2½ in. thick planed off to form a half cylinder. The top of the curve should be slightly flattened and the board should be lightly padded and smoothly covered with sheeting or, better still for woollen fabrics, with woollen material.

Tailor's Cushion

A tailor's cushion is a great help for pressing into shape curved parts such as front and back shoulder darts, for shaping the collar, and for shrinking out any slight fullness at the top of the sleeve. It should be oval, about 12 in. long, and 8 in. wide tapered to 4 in. at the smaller end.

To make the cushion, you need two ovals of strong white material about 13 to 13½ in. long and about 9 to 9½ in. wide at the bigger end tapering to 5 in. at the other. Stitch the two pieces together with two rows of stitching ½ in. apart and ½ in. from the edge, leaving about 4 in. open. Turn right side out and stuff very firmly with dampened clippings from scraps of woollen material. It must be very firm when filled, and the 4 in. opening must be sewn up securely. It is a good idea to have one side of the cushion covered with woollen cloth.

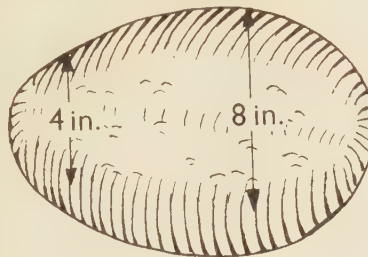
Tailor's Clapper

A smooth finish without shine can be achieved with a tailor's clapper or beater. It is particularly useful for

PRESSING WOOLLEN FABRICS



With a seam board the imprint of the seam allowance is not left on the right side of the material. A wooden rolling pin sawn lengthwise and padded and covered makes a good seam board.

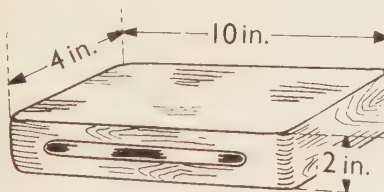


An easily made tailor's cushion provides a good base for pressing curved parts into shape.

pressing thick parts of heavy woollen garments where it is difficult to get a sharp, finished edge. Such parts are buttonholes, lapels, hems, and pleats which all need pressing on the right side.

Place the material to be pressed right side up on a soft, well padded ironing board, cover first with a dry

▼ A tailor's clapper is very useful for pressing thick parts where it is difficult to get a sharp edge. The grooves on the side make it easier to hold.



woollen cloth, then a wet press cloth, and press with a hot iron to generate steam in the material. When the steam rises lift the iron and bang the clapper down in its place. Hold it there until the steam has left the fabric. The weight of the clapper against the soft padding embeds the heavy areas, giving a flat, smooth top layer and the fabric is pressed without being overpressed. Repeat the process until the whole area has been pressed.

To make the clapper use a board 10 in. long x 4 in. wide x 2 in. deep and have it sanded to smooth the rough edges and to round off the corners. If grooves are put in the long edges, the clapper is easier to hold.

Pre-shrinkage of Woollen Fabrics

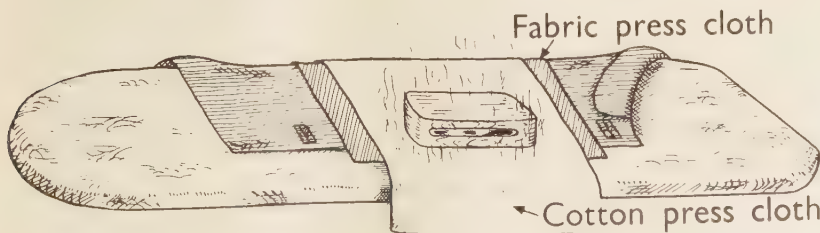
Woollen materials should always be shrunk before they are made up. Often this is done during the manufacture of the fabric, but if it is not, it should be done at home. Unless the fabric is pre-shrunk, the garment may shrink when it is wet in a shower of rain, when it is washed, has something spilt on it, or at the seams when it is pressed.

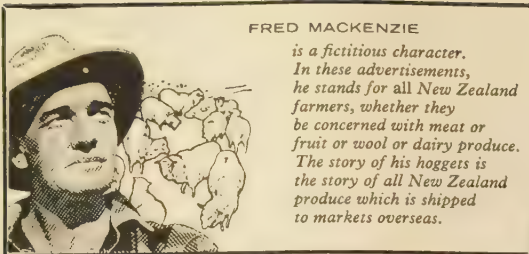
To Shrink Wool

Place the material face down on the ironing table, cover with a wet cloth, and press with a hot iron, steaming the whole of the fabric and ensuring that the lengthwise and crosswise threads stay at right angles. Hang the material over a clothes line or over an open door to dry and air.

It is important to understand that there are two types of shrinkage in woollen materials—relaxation shrinkage and true shrinkage. Shrinkage of new material before it is made up is merely a relaxation of the tension put on the wool during weaving and it allows the fibres to return to their original size. Moisture alone will cause the fibres to relax, but pressing is necessary to restore the surface texture of the material.

True shrinkage is when the fibres interlock and become matted together

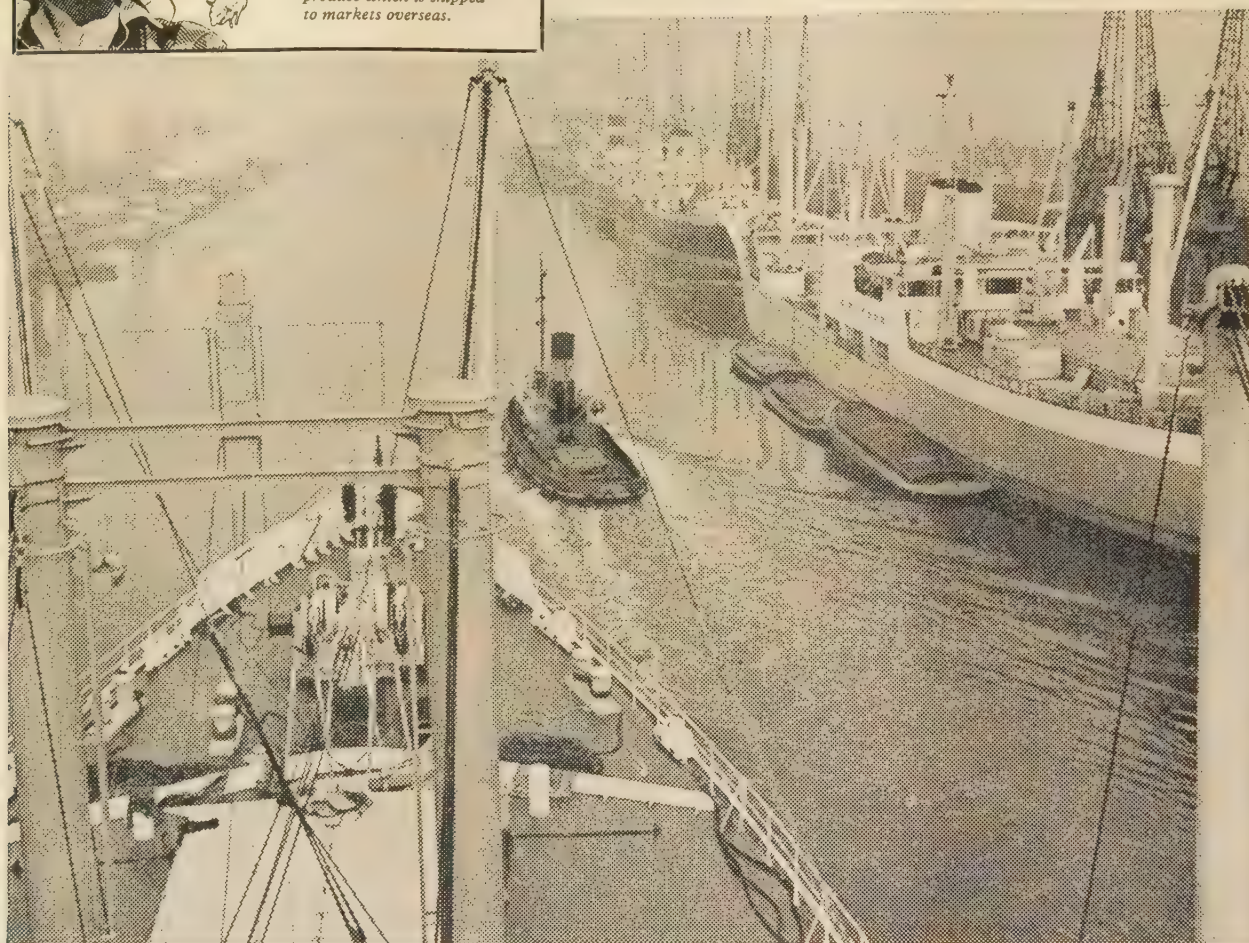




FRED MACKENZIE

is a fictitious character. In these advertisements, he stands for all New Zealand farmers, whether they be concerned with meat or fruit or wool or dairy produce. The story of his hoggets is the story of all New Zealand produce which is shipped to markets overseas.

**YOUR HOGGETS, FRED,
ARE VERY NEARLY HOME...**



Ever since yesterday morning we've been in sight of land. The coastline of Southern England has been slipping steadily past on the port side as we came up Channel, through the Straits of Dover and into the Thames. Now, home is in sight—meaning No. 28 Berth, Royal Albert Docks, London—and nobody's going to pretend that's a very inspiring bit of scenery. But Tim Elliott, the Third Officer, doesn't mind. If he thinks about it at all it's just to feel it's nice to be home again, nice to think he'll soon be seeing all the old, familiar places that lie beyond the docks.

And somewhere back beyond the river banks, behind the City's ancient pomp and pageantry, lie countless homes where housewives sally forth each day with shopping bags in hand. Housewives, many of them, who will ask the shop assistants for New Zealand produce not just because it's the best, but because of something else as well. Housewives with cousins in Wellington,

sisters in Timaru. Housewives whose guest of honour next weekend may be a joint of tender lamb that's come 12,000 miles to greet them.

And talking of lamb, Fred...Unlike Tim Elliott, Harry Briggs (the Chief Freezer) hasn't seen much of the coast slipping by. Or the slow entry into London's docks.

His job's not finished yet—nor will it be until we get the hatch covers off and start discharging cargo. Sustained by thoughts of certain air-mail letters that await him when he berths (and carrying a New Plymouth post mark), he's still down below looking after your hoggets. And all's well; your hoggets, Fred, are still in prime condition.



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as happens when a woollen garment is rubbed against itself when wet. You get the same effect when pressure and friction are applied by a hot iron being moved about on the material while it is damp.

Shrinking out Slight Fullness

In fitted woollen garments it is desirable to have smooth seams without gathers caused by easing on one section to another, as in fitting the sleeve into the armhole. When shrinking out this fullness the aim is to cause interlocking of the wool fibres so that they take a definite shape to fit over curved parts of the figure. Shrinking out fullness is not a reversible process—once it has been done, it cannot be undone, so it is advisable to practise on a sample before it is attempted on a garment.

Put the part of the garment to be shrunk over the end of the sleeve board or over the tailor's cushion, whichever reproduces best the body curve it is designed to fit. Press with a damp cloth and move the iron about, keeping it pressed down hard, but be very careful to treat only the area where the shrinkage is wanted. The simultaneous heat pressure, moisture, and movement causes the shrinkage.

As in other forms of pressing, the material must not be pressed until it is dry. There should be some steam left in the fabric, and it should be left on the shaped surface until it is completely dry. In this way the shape is built in.

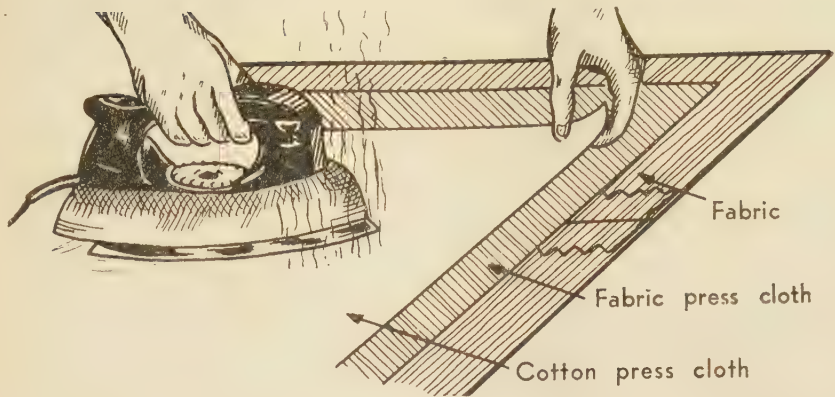
Pressing

In pressing, as distinct from ironing, the iron has practically no motion and the wool fabric is dampened with steam generated by the hot iron on a wet cloth. Place the iron on the part to be pressed, hold it there while steam from the damp press cloth is forced through the material, then lift it and put it down on an adjacent part of the material until it has all been pressed. At this stage the pressed area can be ironed very lightly to remove any outlines of the edge of the iron. The iron should not be left on the material until it is dry, as this would flatten the surface and make it shiny and harsh. Move the iron to another area while there is still steam in the cloth. When the garment is completely pressed hang it up until it is thoroughly dry.

Wherever possible woollen fabric should be pressed in single thickness only and on the wrong side. A press cloth should always be used because wool scorches easily. A steam iron can be used successfully without a cloth when pressing on the wrong side, but even with a steam iron a cloth should be used on the right side.

When pressing woollen fabrics on the right side with a dry iron use two press cloths; one a woollen one, preferably of the same material, next to the fabric, and the other a damp one

PRESSING WOOLLEN FABRICS



A press cloth prevents scorching or shininess. When pressing woollen materials on the right side use two, a dry woollen one next to the fabric and a damp cotton cloth over the woollen one.

over the woollen one. This is the most satisfactory method of retaining the original surface texture, especially with fabrics that have a distinct nap.

To raise a nap that has been flattened use a press cloth of the same material with the nap surfaces facing each other. Put a wet, but not dripping, cotton press cloth over this. Place a hot iron on the wet press cloth, hold it there to generate steam, lift it off, then while the fabric is steaming, pull the press cloth up quickly. The friction between the two napped surfaces raises the nap.

Always press with the straight grain of the fabric. This is especially important when pressing bias edges, necklines, and large areas such as a skirt.

Take care not to stretch edges, and when making the garment up do not let one seam be crossed by another before the first one has been pressed. Press darts and tucks before sewing the seams.

Pressing over tacking is frequently necessary along edges with enclosed seams, pleats, or hems. Press lightly with the tacking in place, then clip and remove it without disturbing the fabric, and complete the pressing. Never leave pins in fabric while it is being pressed.

When pressing a complete garment start with the smaller areas and finish with the larger, less intricate parts. In this way no fresh wrinkles are made in parts already pressed.

Liver Paste

TRY this home-made liver paste to ring the changes in a cut lunch.

Liver paste is a nutritious savoury spread especially popular with men. Use it plain in sandwiches and on cracker biscuits, or add finely chopped parsley, chives, onion, or walnuts for extra flavour. The recipe can be doubled for a large quantity and the paste will keep for some time in the refrigerator provided it is well covered.

1 lb of calf liver
 3 lb of pork fat
 1 oz of butter
 1 oz of flour
 1 cup of milk
 2 eggs

1½ teaspoons of salt
 ½ teaspoon of pepper
 ½ an onion
 ½ teaspoon of allspice
 2 tablespoons of dry sherry

Wash the liver, cut it into small pieces, and mince twice with the fat and the onion. Make a white sauce using the butter, flour, milk, salt, and pepper. Add the minced liver to the hot sauce and allow to cool.

Mix in the eggs one at a time and season with the allspice and the sherry. Place the mixture in a well

greased basin and stand it in a pan of water to bake. Bake at 350 degrees F for 1 to 1½ hours.

Force the hot paste through a coarse sieve and keep it in covered jars in the refrigerator.

The sherry and allspice may be omitted for children, though these ingredients give a characteristic flavour to the paste.

Liver and Walnut Balls

Add 1 dessertspoon of mayonnaise or cream and 2 tablespoons of chopped chives to 4 oz of liver paste and blend well. Roll the mixture into small balls and coat with finely chopped walnuts. Place each ball on a toothpick and serve on a bed of crisp lettuce.

—NAOMI F. BANKS,
 Home Science Instructor,
 Department of Agriculture,
 Auckland

Make This Set of Attractive Quilted Table Mats

By NAOMI F. BANKS,
Home Science Instructor,
Department of Agriculture,
Auckland

A SET of quilted table mats is a useful and decorative addition to your collection of table linen. Beside looking most attractive on the table, they are thick enough to be used without under-mats and, being made of sturdy fabric, will wash well. The mats illustrated were made from glazed chintz with a floral design in shades of olive green and pink forming oval medallions (six to every $2/3$ yd) and these were used as the pattern for the mats. Each medallion is a picture in itself and gives the set unity. However, any washable cotton or linen fabric with a small pattern is just as suitable.

MATERIALS needed for six oval mats each $12\frac{1}{2}$ in. by 10 in. are:

$2/3$ yd of glazed chintz 40 in. wide
 $2/3$ yd of toning cotton sateen 40 in. wide for lining
 $1\frac{1}{4}$ yd of wadding 24 in. wide

6 yd of toning bias binding
6 yd of fringe, braid, or candlewick

Preparing the Material

Place the wadding over the wrong side of the lining and stitch the two together with extra large herring-bone stitches taking up only small portions of the lining material so that the stitches will not show. Pin the chintz to the wadding and tack it in place with large stitches. Make quite sure that these three layers are firmly attached to each other or the top layer will slip and pucker when being quilted.

Quilting the Material

The material may be quilted in the piece or cut into oblongs slightly larger than the size of the finished mats and quilted separately. An inexperienced sewer will find the smaller pieces easier to handle.

On the lining side mark a diagonal line on the exact bias of the piece with tailor's chalk or pencil. Machine stitch on this line from corner to corner using a slightly longer stitch than for normal sewing. Mark in lines $1\frac{1}{2}$ in. apart and parallel to the stitched line, then stitch along these lines starting from opposite ends each time. This prevents the material puckering.

When the piece is all stitched in one direction mark in lines $1\frac{1}{2}$ in. apart in the opposite direction to form a diamond pattern and stitch along these lines as before to complete quilting.

Press the quilted fabric lightly on the wrong side.

If you have not tried quilting before, it is advisable to practise on a spare piece of padded material to check the stitch length and tension and make sure your work is perfect, as the stitching must be straight and even for the best effect. Many sewing machines have a quilting guide as part of their attachments. The use of this will save marking in the stitch lines and the quilting can then be done on either side of the material.

Finishing the Mats

Cut the mats to the desired size. With the mats in the illustration the oval medallions made this very easy.

Bind the edges with matching bias binding.

To give the finishing touch, stitch braid, fringe, or candlewick over the binding. Candlewick was used to trim the mats illustrated and it makes a finish that is practical and washable beside being attractive.

[Sparrow



Growing Waratahs

By F. E. WILKIN,
Plant Quarantine Officer,
Department of Agriculture,
Invercargill

THE glorious red-flowered waratahs are shrubs and small trees of south-east Australian origin. They have pride of place in gardens in every country fortunate enough to have a climate suitable for them. In New Zealand there are many localities well suited to the needs of each of the three species. As all of the species can be grown as medium-sized shrubs, it is possible to grow them in quite small home gardens.

WARATAHS will grow in many soil types, but do particularly well in alluvial soils, especially those of a stony type and on soils that resemble their native sandstones. Good drainage is a principal need and sunlight, shaded roots, reasonable shelter, and protection from excessive frost are also important. Sensitivity to frost varies according to species.

The crimson waratah (*Telopea speciosissima*) being the most sensitive is suitable for coastal or light frost areas mainly in the North Island, while the other two species, Gippsland waratah (*T. oreades*) and Tasmanian waratah (*T. truncata*) are much more hardy and grow well in many parts of Southland and Stewart Island.

Waratahs do not grow well in shaded positions, though the roots like shade. They respond to good treatment, but not to heavy dressings of fertiliser. Reasonable dressings of well rotted compost, dried blood, or blood and bone should be beneficial.

The heads of waratahs resemble giant crimson *Protea* flowers to which they are related; indeed, the waratah is probably the most attractive member of the *Protea* family. The botanical name *Telopea* is apt, signifying seen from afar, which is especially true when they are in bloom on their native rocky hillsides.

Crimson Waratah

(*T. speciosissima*)

The crimson waratah *T. speciosissima* (New South Wales waratah) is the

most magnificent member of the family. Its beauty is so highly regarded in its native New South Wales that it is the emblem for that State.

In New Zealand it is generally known as the New South Wales waratah, but crimson waratah is the standard popular name chosen by the American Joint Committee on Horticultural Nomenclature.

The great globular crimson flower heads of this species are surrounded by several whorls of equally beautiful crimson bracts. Each bract is up to 3 in. long and is fairly wide at the base and pointed at the tip. These large bracts and the prominent veins and toothed margins of the leaves distinguish this species.

The crimson waratah generally grows about 6 or 7 ft high and flowers about the third or fourth year from

The crimson waratah *Telopea speciosissima*, showing foliage and large red terminal flower head. Crimson bracts surround the ball of red flowers.

planting. Some specimens have been known to reach 10 or 12 ft high. It is more suited to the northern districts, as it is fairly frost tender, especially in the seedling stage, but is often grown successfully in gardens in coastal districts as far south as Wellington. Mature specimens have been seen in bloom at Greytown in the Wairarapa district where 7 degrees of frost has been recorded on an airtight thermometer a few feet above the ground and 13 degrees of frost on the grass.

Plants should be protected when they are small, as the frost is usually much more severe on the ground than



[Elliott]

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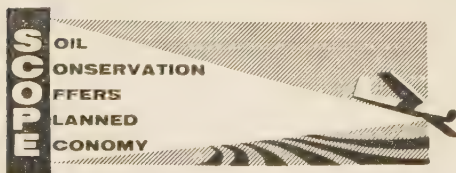
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GROWING WARATAHS . . .

it is in the air 3 or 4 ft above it. In districts where frosts occur young waratahs should be protected with a frame covered on the top and sides with two layers of scrim or hessian, and there should be about an inch of space between layers. This cover should be placed over the plant on winter nights when frost is expected, and removed during the day. None of the material of the frame should be allowed to rest against the foliage, as the frost may strike through and kill the plant.

Crimson waratah is used in the cut flower trade and usually commands high prices in the markets.

Gippsland Waratah (*T. oreades*)

In the botanical name of the Gippsland waratah *T. oreades*, *oreades* means a mountain nymph. This species, which has large, flat, dark crimson blooms, is hardly less beautiful than the better known crimson waratah. The distinctive features are the short hairless bracts an inch or less long and the dark leaves, which contrast well with the colour of the flowers; the leaves lack prominent veins and have uncut edges.

Gippsland waratah comes from Victoria. It is hardy and will thrive in areas a little too cold for crimson waratah. It may be kept as a shrub 10 to 12 ft high with an upright form, but may eventually form a tree 40 ft high, with a trunk as much as 2 ft in diameter. The wood is said to be beautifully figured and grained and is used in cabinet making and veneers and for tool handles.

A Gippsland waratah seen at Greytown in the Wairarapa was about 9 to 10 ft high and bore hundreds of blooms. Sometimes shrubs of this species are disappointing. This is due to an off-type plant or to unsuitable soil conditions or lack of shelter.

Tasmanian Waratah (*T. truncata*)

The thick leaves of Tasmanian waratah (*T. truncata*) are shorter than in the other kinds of waratah and the short bracts surrounding the flowers are clothed with closely pressed silky hairs. *Truncata* signifies cut off or shortened and probably refers to the blunt-ended leaves of this species.

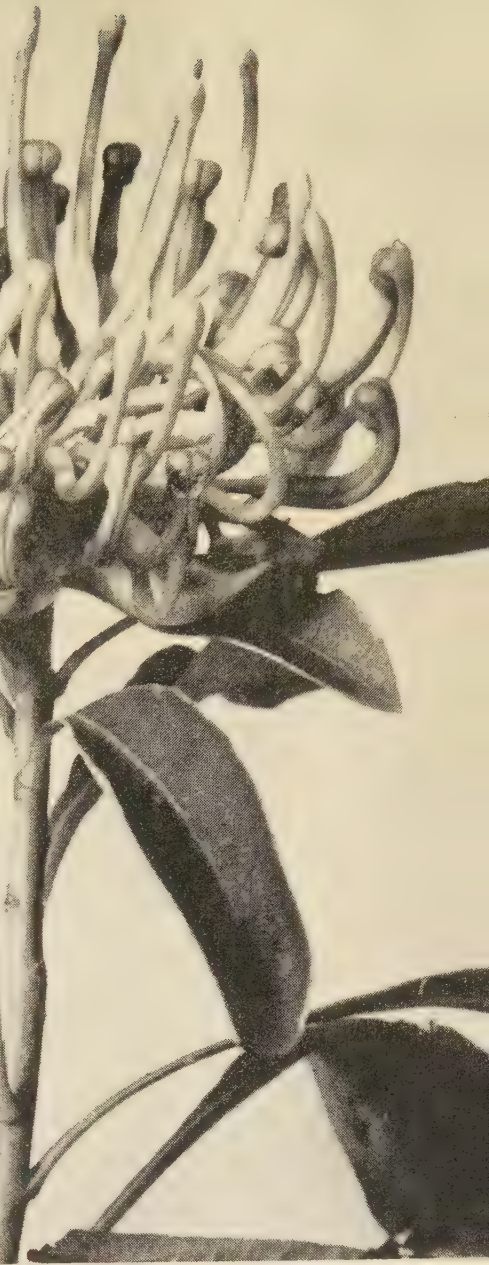
The species, a native of the Tasmanian highlands, is more hardy than the Australian species. It has smaller flowers than the others, but can be grown in many parts of the South Island. In the garden it can be kept as a shrub 5 to 8 ft high, but may eventually reach 20 ft under exceptionally good conditions. Sometimes this waratah has quite large flowers; occasionally there are white specimens in

Tasmania. It is a summer-flowering type and it flowers as early as November in Southland.

Pruning

Pruning should be done with care, as cuts into older wood do not callus. By judicious pruning back when cutting flowers and the removal of spent flowers back to a bud it should be possible to maintain these shrubs in reasonable shape.

Each year all dead and broken branches should be cut back to laterals with sharp tools. Any cuts over about $\frac{1}{2}$ in. in diameter should be painted. The crimson waratah, in particular, needs careful training from planting, as it is inclined to become leggy and severe cutting back may kill it.



Foliage and blooms of the dark crimson Gippsland waratah *Telopea oreades*. [Elliott]

Crimson waratah can be trimmed to a rounded shape, but the Gippsland and Tasmanian species should be trained to conform with their naturally more upright habit.

Pests and Their Control

Rose scale (*Aulacaspis rosae*) and waratah scale (*Phenacaspis eugeniae*) sometimes infest waratahs. These pests are both whitish scales. They can be controlled with summer oil spray $1\frac{1}{2}$ per cent dilution in water. To make four gallons of the spray the formula is $\frac{1}{2}$ pint of summer oil to 4 gallons of water.

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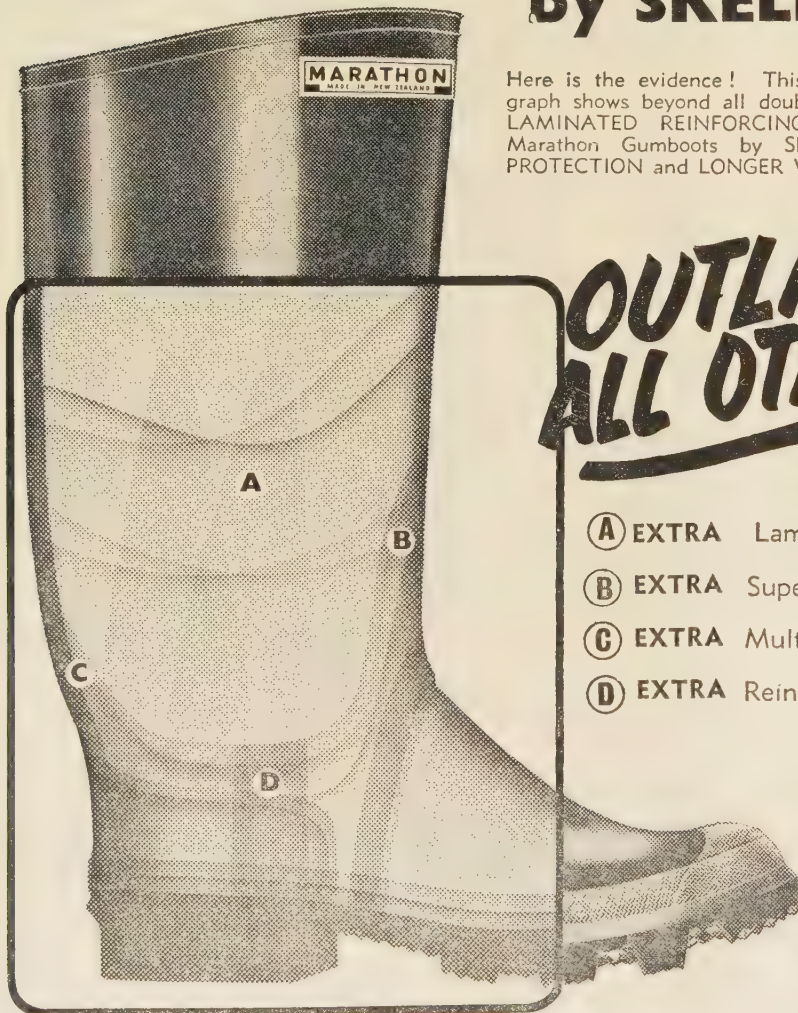
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Garden Work for June



Camellias are in flower now and are most useful for cutting. The earliest to flower are the sasanquas. They are free flowering with single blooms, and the plants do well in most parts of the country and on most acid soils. Later in June the many beautiful named varieties of *C. japonica* and *C. reticulata* start to flower. Those of *C. reticulata* have the largest flowers, and their characteristic dropping of their blooms as soon as they begin to fade is a useful habit, but they are the most difficult type to grow.

The winter-flowering heaths are colouring up, *Calluna* H. E. Beale and Springwood white, *Erica carnea* King George and Winter Gem, being particularly good varieties. Both heaths and camellias require a lime-free soil and cool, moist conditions for maximum growth. They thrive in partial shade, the heaths being useful as ground covers under other shrubs, for example, rhododendrons, while they all appreciate an annual topdressing of leaf mould.

Many proteas are flowering in the milder parts of the country. These make handsome and unusual cut flowers, though their nectar attracts ants and can damage furniture on which it may drop.

The flower stems should be cut so that a few leaves remain on them to provide buds for next year's crop of flowers. If cut back into bare wood, the stem is unlikely to sprout again

and will probably die back. Judicious cutting of the flowers is usually sufficient pruning for these shrubs.

Daphne odora does well in the north and *D. genkwa* and *D. mezereum* in the south. Most daphnes suffer from a virus disease which causes a yellowing of the leaves. Badly affected bushes should be destroyed.

Particularly on heavy clay soils, they live for only about seven years. For this reason, it is desirable to raise replacements from healthy plants at intervals. *D. mezereum* can be raised from seed, while the other species may be struck from layers or from cuttings taken of the tips of side branches in autumn.

By JOY WATKINS,
Horticultural Advisory Officer,
Department of Agriculture,
Auckland

In frost-free districts luculia, *Podalyria sericea*, eriostemon, and reinwardtia add to the colour and scent in the garden.

As the days shorten, there is less growth of plants in the garden. Vacant ground should be dug over and weeds removed or buried, compost, leaf mould, or manure being incorporated at the same time.

Lime is required by a few ornamental plants such as anemones, scabious, gypsophila, lavender, and carnations, and where new beds are being prepared for any of these flowers agricultural lime at about 1 lb to the square yard (if the soil is very acid) or proportionately should be

spread on the surface after digging so that the winter rains will wash it into the soil. Lime can also be applied to the soil around established plants, if this has not already been done.

Lime must not be applied to camellia, rhododendron, azalea, heath, and similar acid-loving plants; otherwise the leaves will turn yellow and the plant may die.

Pruning

Many deciduous trees and shrubs can now be pruned, as the leaves have dropped and the plants are dormant. Those which produce flowers during winter and early spring should be left until they have finished flowering.

Many shrubs and trees require only light pruning to maintain the shape of the plant. Dead, diseased, or weak crowded branches should be cut away at the same time. Where two branches cross and rub, one should be removed to allow the other to develop properly. Ornamental trees which have grown too tall can be headed back by cutting the main stems back to side branches at a suitable height. They should not have all upright stems sawn off level to the same height, regardless of whether there is a side shoot or not, as a bare stump will either die back or it will produce a ring of new upright branches in the following season. By cutting to a side branch, the flow of sap in the spring is diverted along this branch.

As wistaria flowers at the base of growth made during the last season, this growth should now be cut back to a bud within a few inches of the old wood, so that the flowers will not be hidden by leaves and branches.



[Sparrow



[Sparrow

Propagation of daphne by layering. Left—Prepared layer showing how shoot is twisted at the point of cutting to expose cut surfaces to soil moisture when layer is buried, thus encouraging rooting. Right—Rooted layer cut from parent plant. Rooting normally takes about eight months.

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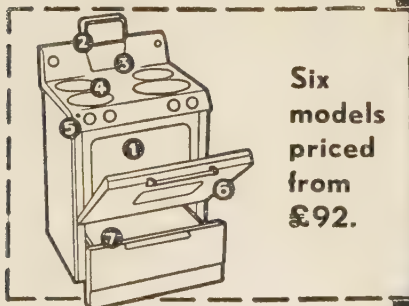
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Shrubs which are frost tender, for example, poinsettia, luculia, and bougainvillea, should not be pruned until danger of frost is past.

Roses can be pruned between the middle of June and the end of August, the end of August being preferable where there is any likelihood of frost damage. Those which are left until August should have any very long stems shortened, as these are likely to catch the wind and cause the bush to rock backward and forward. In a light soil the roots are loosened in this way. In a clay soil a funnel forms round the base of the stem and water collects, causing damage or death of the plant.

Where gardens are exposed to strong winds every effort should be made to provide adequate shelter. Where a solid wooden or metal fence is impracticable, alternatives are hedges or open fences or trellis with strong climbing plants growing through them.

The ground must be well prepared for either climbing or hedge plants, by digging deeply, incorporating leaf mould or compost, removing weeds, and possibly also providing drainage.

Drains should not be placed near hedges, as the roots grow into them and block them. Rock or scoria drains would be more suitable. Once the plants are established little can be done to improve the drainage; yet poor drainage is one of the most frequent causes of the death of hedge plants. On a heavy, badly drained soil many of the roots may be killed by prolonged spells under water.

Soil-borne diseases such as phytophthora and fusarium can then gain easy entry into the damaged root system, causing root rotting or collar rotting, which is usually fatal.

The first sign may be a yellowing of the leaves, lack of growth, and die-back of the branch tips. This is the direct result of root injury, as a damaged root system is unable to absorb sufficient water and minerals to supply the leaves and branches. Any plants which have died in this way should be removed and the ground treated with copper oxychloride at 1 lb to 5 sq. yd. before replanting. If the drainage can be improved in any way, for example by digging a drain on a lower level near the hedge, this should be done.

Some of the best hedge plants are slow growing, and it may be an advantage to grow a row of tree lupin or brush wattle (*Albizzia lophantha*) on the windward side, being removed when the hedge is sufficiently established. The ground should be prepared now, ready for sowing in October.

Continue planting trees and shrubs, staking and tying where necessary.

Herbaceous Perennials

Stems of herbaceous perennials have died back and can be cut off at ground level and burnt or composted. The



[Elliott]

Phyllica pubescens, the flannel bush, grows about 2 ft high and has silvery green flowers which are ideal for cutting in winter. It stands frosts of up to 8 degrees and likes a sunny, well drained position on lime-free soils.

ground between the plants should be forked over carefully to remove weeds, let in the air, and allow winter rains to drain freely through the soil. Care should be taken to avoid damaging the buds and surface roots.

Rock Garden

In the rock garden remove any dead leaves which may have collected in or on the plants, as these can cause rotting, apart from harbouring slugs. Plants with woolly leaves are particularly liable to rot, and these should have perfectly drained sites prepared for them before planting, the choicer species being protected during winter by a sheet of glass.

Floral Arrangements

Poinsettias and Iceland poppies must be seared before being placed in deep water overnight to harden. Searing consists of holding the end of each stem over a flame for 15 seconds to disperse the milky juice which will otherwise congeal and prevent the absorption of water.

Only fully developed violets should be picked, as buds will not open in water. Violets left out of water for a while can be revived by immersing them completely in water for an hour or so before arranging. Few people have the patience to arrange such

small flowers individually and violets are most easily used tied in small bunches which are readily fixed in moss or wire netting or on a pinholder. In this way they make a bold mass of colour which can form the focal point of the design.

Foliage plants come into their own during winter to provide a setting for a few flowers or an independent decoration. As an independent decoration cut foliage can be used or pot plants can be grouped in a container.

Of the large range of winter-flowering shrubs which can be grown in New Zealand many have distinctive individual flowers, such as protea, phyllica, dryandra, and banksia; others produce sprays of tiny flowers, particularly in shades of cream, pink, and red, for example manuka, thryptomene, calytrix, and hypocalymma.

It is essential to slit or bruise the stems of all cut shrubs and to place in deep water in a cool, dark place overnight before arranging; otherwise many branches will not take up water quickly enough when placed in a warm room and the flowers will soon wilt and die.

Shrub flowers should be cut with a sharp knife or secateurs to just above a bud, being careful to maintain the shape of the bush.

Twenty

Ways

with

Mayonnaise

By NAOMI F. BANKS,
Home Science Instructor,
Department of Agriculture,
Auckland

PLAIN or fancy mayonnaise is an easy way of making favourite salads even better. Try plain bland mayonnaise with a highly flavoured dish, or perk up a simple salad by stirring extra flavours into the mayonnaise just before it is used.

MAYONNAISE is a rich, smooth dressing made from egg yolks or whole egg, oil, vinegar or lemon juice, and seasonings.

Care must be taken during mixing to ensure that the mixture does not separate out. The oil is added to the beaten egg slowly, one drop at a time, and beaten continuously with a fork (which traditionally should be solid silver), a rotary beater, or an electric mixer. As the mixture thickens, larger quantities of oil can be beaten in without danger of the mayonnaise curdling.

If the mixture does curdle, the ingredients need not be wasted. Start again with a clean bowl and fresh egg or yolk, then beat in the curdled mixture drop by drop, adding extra oil when the egg-oil mixture is finished. The consistency of the mayonnaise depends on the amount of oil used. The more oil used, the thicker the result, and oil can be added until the mixture will hold its shape for decorative piping.

Basic Mayonnaise Recipe

2 egg yolks	or one	2 tablespoons	of
whole egg		lemon juice	or
$\frac{1}{2}$ teaspoon	of dry	vinegar	
mustard		Salt to taste	
12 to 18 oz of soya			
bean oil			

Beat the egg, salt, and mustard in a deep basin. Add the oil, one drop at a

time, beating continuously. When half the oil has been used beat in the lemon juice or vinegar, then continue beating in oil in small amounts until the mixture is the desired consistency.

Store in a covered jar in a cool place.

Piquant Variations

For variations of the basic mayonnaise stir in to taste any of these ingredients:

- Curry powder
- Chilli powder
- Made-up mustard
- Paprika
- Anchovy paste or sauce
- Chilli sauce
- Capers
- Chopped chives
- Chopped parsley
- Horse radish sauce
- Onion juice
- Finely chopped spring onion
- Finely chopped green pepper
- Crushed garlic
- Herbs, dry or fresh

Remoulade Sauce

Add 1 teaspoon each of onion juice, lemon juice, finely chopped chives, parsley, and capers to mayonnaise and serve with fish or fish cakes.

Tartare Sauce

Add 1 teaspoon each of finely chopped parsley, gherkins, olives, and mustard to thick mayonnaise and thin it with dry white wine and red wine vinegar.

Blue Vein Mayonnaise

Add 2 tablespoons of finely crumbled blue vein cheese and 1 tablespoon of milk to $\frac{1}{2}$ cup of mayonnaise. A few drops of tabasco sauce give a good flavour to this dressing.

Pineapple Mayonnaise

Add $\frac{1}{4}$ cup of crushed pineapple and 1 tablespoon of lemon juice to 1 cup of mayonnaise. Serve with cabbage salads.

Creamy Mayonnaise

Whip $\frac{1}{2}$ cup of cream and fold it into 1 cup of mayonnaise. Blend the mixture well and serve with salads containing fruit.





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